biosan

Medical–Biological
Research & Technologies

CATALOGUE 2015–2016 v2

WORLD OF BIOTECHNOMICA

WELCOME TO BIOSAN
PRODUCT CATALOGUE 2015–2016

Our mission is the development, manufacture and supply of innovative laboratory instruments developed on the base of the uppermost advanced scientific and manufacturing technologies.

For more than 23 years Biosan has been a reliable partner for everyone who chooses equipment for working in the fields of biomedical diagnostics, biotechnology and Life sciences.

Biosan catalogue 2015–2016 presents devices for mixing, vortexing-centrifugation, incubation, cultivation, water purification systems, DNA/RNA UV cleaner–boxes, devices ensuring biosafety of laboratory air, as well as analytical solutions for bioprocesses.

SOLUTIONS FOR SAMPLE PREPARATION

Biosan Research & Development team is constantly focused on solving irreproducibility problems of experimental data that is usually caused by the complexity of biological material sample preparation. The lack of strict regulation in sample preparation determines the most errors during the reproduction of the method. Errors accumulate due to the decrease of the reactant's volume, the absence of intermediate temperature logistics of mixing, the lack of air decontamination systems in laboratories during the working process, and no regulations for cellular material storage. We offer new developments only after making sure they do bring the needed sample preparation solution.

WORLD OF BIOTECHNOMICA

In 2005 Biosan put forward the concept of the **World Biotechnomica** (see page 108) following which we are ready to offer you not only already known devices, but brand new unique equipment. The orbits of the World Biotechnomica were filled by the new satellites, Reverse-Spinner **RTS-1** and **RTS-1C** (see page 38) - personal bioreactors which provides logging of microbial growth in real time. RTS-1 and RTS-1C provide reproducibility of cell preparation (cryopreservation, obtaining cell material in a given phase of growth, etc.) and facilitate reproducibility of manipulations with complex biological structures, which are the cells of micro and macro-organisms. The next generation of mini-bioreactors is the development of a matrix bioreactor – a multichannel detector of cell culture growth concentration Smart Platform, intended to control the optical density in the Erlenmeyer Flask.

We also pay attention to the development of conventional diagnostic techniques. The product line for enzyme-linked immunosorbent assay (ELISA) has been replenished with a new product – the Microplate Photometer **Hypo MPP-96** (see page 98). Its reliability of measurements and the data processing program are approved by appropriate external laboratory tests.

On the orbit of Genomics there is a new device for Life Sciences market - the centrifuge-vortex for PCR plates **CVP-2** (see page 46). Using an innovative SMS algorithm for performing the PCR analysis allowed us to obtain a high expert evaluation from the leading Life Sciences laboratory in the Baltic.

Among the new products for biosafety there is the long-awaited laminar cabinet, providing thermostatting of the laminar flow – **TLC-S** (see page 93), that means the active control of temperature shelf, so necessary when working with cell cultures and experimental animals.

In 2016, among the new products in the field of cellomics the new CO2 thermostat-incubator **S-Bt Smart Biotherm** will appear (see page 6), designed to work with cell cultures where it is necessary to maintain a given concentration of carbon dioxide.

CUSTOMER SUPPORT

Our team of highly skilled specialists provides prompt solutions in questions of product ordering, operation and maintenance. We advise our customers on the stage of equipment ordering and pay attention to all requests and wishes. Company's professionals provide solutions to the problems occurring during operation and maintenance of equipment, as well as quickly and efficiently solve the issues of the warranty and post-warranty service. We always encourage our customers to visit our production department and complete the training for operation and maintenance of our products.

Additional information about the products can also be found on the website **www.biosan.lv** in 7 different languages including product videos that demonstrate functional characteristics of the equipment, up-to-date brochures, user manuals.

VISION

We are planning to continue constant development and improvement to be on the leading positions of fast emerging World of Biotechnomica. It allows us to open new opportunities and to enter new markets, thus staying in one line with the leading bioengineering companies in the European Union.

I will be happy if you are interested in Biosan products.

Thank you for the cooperation!

Vasily Bankovsky, Doctor of Biological Sciences, R&D director,

Chairman of the Board at Biosan.

NEW PRODUCTS AND ANNOUNCEMENTS
RTS-1, RTS-1C, MPS-1, HiPo MPP-96, TLC-S, TS-DW, S-Bt, CVP-2, Labaqua Series
NEW 4

MIXING DEVICES: ROCKERS, SHAKERS, ROTATORS, VORTEXES
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Shakers: 3D, Multi Bio 3D, PSU-10i, PSU-20i, MPS-1, PSU-2T
Rotators: Bio RS-24, Multi Bio RS-24, Multi RS-60
Vortexes: V-1 plus, V-32, MSV-3500

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THERMO–SHAKERS
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Shakers-Incubators: ES-20, ES-20/60
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Minicentrifuge: Microspin 12
Centrifuges: LMC-3000, LMC-4200R

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Orbital/Linear Shaking Bath: OLS26, LSB Aqua Pro
Unstirred Water Baths: Sub Aqua Pro
Heating/Cooling Circulators: Grant Optima™ series, Optima™ R series

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BIOSAFETY EQUIPMENT:
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DNA/RNA UV-Cleaner Boxes: UVC/T-AR, UVC/T-M-AR, UVT-B-AR, UVT-S-AR, TLC-S
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WASHERS, ASPIRATOR
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NEW

RTS-1, RTS-1C

Personal bioreactors

RTS-1 and **RTS-1C** are personal bioreactors which provide "Reverse-Spin" type of agitation and logging of microbial growth in 50 ml tubes in real time.

- Innovative mixing due to reverse spinning of the sample around its own axis
- Due to innovative mixing technology it is possible to measure optical density of the probe in real time
- Software has been developed to store, display and analyse the data in real time
- **RTS-1** and **RTS-1C** are compact devices with low profile and small footprint for personal application
- Temperature control allows to use **RTS-1** and **RTS-1C** as an incubator, e.g. for cell growth
- **RTS-1C** has a function of active cooling and temperature profiling via software
- The ability to change parameters such as temperature, RPM and "Reverse-Spin" frequency, allows to achieve consistency and reproducibility of results
- Programmable Cycling/profiling of cultivation parameters such as temperature, RPM, "Reverse-Spin" frequency
- The ability to remotely monitor the process of cultivation while home or using a mobile phone

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ANNOUNCEMENT

TLC-S,

Thermostated Laminar Flow Cabinet

INFORMATION ABOUT THE AVAILABILITY OF THE DEVICE WILL BE PUBLISHED ON OUR WEBSITE WWW.BIOSAN.LV

Thermostated Laminar Flow Cabinet **TLC-S** is a laminar flow biological safety cabinet with HEPA filters that is intended for processing of biological materials. The device is designed for use in laboratories focused on DNA analysis, genetic engineering, molecular biology and laboratories working with cell cultures. Besides HEPA-filtered sterilie airflow the cabinet has two more additional options:

1. Highly efficient filtration is provided by two pleated HEPA filters that meet the requirements of protection class H14. Filters installed in a cabinet, are effective not less than 99.995% if trapping particles of 0.3 micron. In a standard mode, the inflow air enters through the perforated front grille, without penetrating into the working area. The recirculated air in the working area enters the grille in the perimeter of the working area. All the air then flows upwards, where 70% of the air is recirculated through the main HEPA filter and is directed to the working area as a laminar flow, while 30% of the air is directed out of the cabinet through the second HEPA filter.
2. Termostated laminar flow of sterilized air.
3. Recirculation systems with ultraviolet light irradiation to inactivate viral particles, DNA and RNA amplicons in the recirculated air.

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NEW

TS-DW,

Thermo–Shaker for Deep Well Plates

TS-DW Thermo–Shaker is designed for shaking and incubating deep well plates.

A multisystem principle, used in the design of the Thermo–Shaker, allows operating it as 3 independent devices: Incubator, Plate shaker and Thermo–Shaker.

TS-DW provides excellent temperature uniformity across the plate due to patented two-sided heating of the block and the lid, contour heating of the block and close proximity of heating elements to plate walls.

There is a number of interchangeable blocks to suit different plates such as Eppendorf® 96/1000 µl, Sarstedt® Megablock 96/2200 µl, Porvair® 96/2000 µl, Axygen® 96/2200 µl. Also we can manufacture a customized block on request.

ANNOUNCEMENT

HiPo MPP-96, Microplate Photometer

INFORMATION ABOUT THE AVAILABILITY OF THE DEVICE WILL BE PUBLISHED ON OUR WEBSITE WWW.BIOSAN.LV

Features of QuantAssay software:

- ELISA assays of any complexity can be carried out via robust assay editor
- Multiplex assays-up to 7 assays on one plate
- Qualitative assay includes up to 8 controls
- Quantitative assay includes up to 20 standards
- BestFit function for selecting the best calibration curve
- Save, load and export results
- Creating visual reports

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NEW

MPS-1,

Multi Plate Shaker

- High mixing speed up to 3,200 rpm
- Smooth mixing with 3 mm orbit
- 5 mixing presets
- Innovative mixing algorithm Pulse Mode
- Low noise level at maximum speed
- High stability at maximum speed
- Universal platform holder for immunoplates, deep-well plates and platforms for tubes
- Additional platforms for semi – and unskirted PCR plates (200 µl) and for tubes from 0.2 to 2 mL
- Can be used in cold rooms and incubators (temperature range from +4°C to +40°C)

see page 16

ANNOUNCEMENT

S-Bt Smart BioTherm,

Compact CO2 Incubator

CHECK OUR WEBSITE
FOR THE LATESTS UPDATES!

- **S-Bt** Smart Biotherm provides a six-sided direct heating of chamber walls and a door, thereby ensuring uniform distribution of temperature and CO2 within the incubator.
- Built-in high-precision infrared CO2 sensor allows to measure and control the level of CO2. The sensor is resistant to changes in temperature and humidity inside the incubator.
- Stainless steel chamber is securely sealed to minimize contamination and facilitate cleaning.
- **S-Bt** is equipped with a UV air recirculation system – 1 UV lamp and a fan. UV air recirculation system is mounted behind the rear wall of the incubator and provides decontamination of the working space.
- In the wall of **S-Bt** there is a convenient access port that can be used for variety of sensors and wires of devices installed in the incubator.

NEW

CVP-2,

Centrifuge vortex for PCR plates

CVP-2 is a fully automatic device for reproducing sms–algorithm for 2 PCR plates at the same time, thus saving time considerably. A must-have instrument for PCR and DNA analyses laboratory.

CVP-2 is 4 devices combined in 1:

1. Centrifuge – Maximum RCF: 200 × g (1,500 rpm)
2. Vortex (300–1,200 rpm; Vortexing regulation timer 0–60 sec)
3. Centrifuge/Vortex
4. SMS-cycler for realization of the "sms–algorithm"

see page 46

NEW

ULTRAPURE WATER SYSTEMS:

Labaqua Series

- **Labaqua HPLC** produces water with very low organic carbon (TOC) content meeting requirements of liquid chromatography methods. Labaqua HPLC water can also be used for some microbiological and molecular biology applications.
- **Labaqua Bio** system produces water with very low organic and RNase/DNase content that is intended for the use in molecular biology, including RNase-sensitive applications

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CATALOGUE 2015-2016

MIXING DEVICES: ROCKERS, SHAKERS, ROTATORS, VORTEXES

MR-1, Mini Rocker–Shaker

DESCRIPTION

Mini Rocker–Shaker **MR-1** provides regulated gentle rocking motion of the platform and is ideal for mini gel destaining after electrophoresis, conducting Northern, Southern and Western blot analysis.

Shaker is a compact, noiseless device designed for personal use. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for more than 2 years.

Non–slip, temperature resistant, silicone mat located on the rocker's platform provides stable position for vessels during shaking. Optional dimpled PDM mat fixes tubes of different sizes.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C

Rocking uni-rotation

Product video is available on the website

SPECIFICATIONS

Mixing frequency range	5–30 oscill/min
Fixed tilt angle	7°
Max. continuous operation time	168 hrs
Direct drive mechanism	
Digital time setting	1 min–24 hrs / non–stop
Non–slip silicone mat is supplied as standard	
Maximum load	1 kg
Display	LED
Platform working area	215 × 215 mm
Overall dimensions (W × D × H)	220 × 205 × 120 mm
Weight	2.1 kg
Input current/power consumption	12 V, 320 mA / 3.8 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

PDM, dimpled mat

ACCESSORIES FOR THE STANDARD PLATFORM:

Optional dimpled mat **PDM** prevents different size tubes from rolling around the platform

ORDERING INFORMATION:

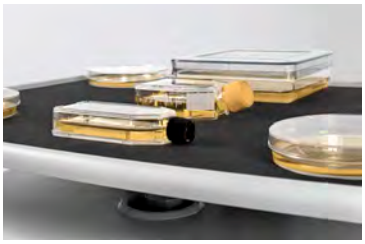
	Cat. number
MR-1 with standard platform **Bio PP-4S**	BS-010152-AAG
Optional accessories	
PDM dimpled mat	PDM

MR-1 with Petri dishes

MR-1 with PDM dimpled mat

MR-12, Rocker–Shaker

Rocking uni-rotation with adjustable tilt



DESCRIPTION

MR-12 Rocker–Shaker provides both soft and intensive mixing of solutions or nutrient media in vessels or plastic bags placed on the platform. Adjustable speed and platform tilt angle allows setting parameters for optimal solution transfer and mixing.

The device is ideal for gel destaining after electrophoresis and homogenisation of bioextraction media. It is optimal for biomolecule hybridization on strips and for staining/destaining procedures. When installed inside a bioincubator it is ideal for growing cells and cell cultures in disposable plastic reactor-bags (working volumes up to 10 liters, media volumes up to 5 liters).

Rocker–Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

SPECIFICATIONS

Mixing frequency range	1–99 oscill/min (increment 1 oscill/min)
Tilt angle range (for 1–50 oscill/min)	0°–10° (increment 1°)
Fixed tilt angle (for 51–99 oscill/min)	10°
Digital time setting	1 min–99 hrs 59 min (increment 1 min) / non–stop
Display	LCD, 16 × 2 signs
Maximum continuous operation time	168 hrs
Maximum load	5 kg
Platform working area	480 × 380 mm (Platform with non–slip rubber mat is included in standard set)
Overall dimensions (W × D × H)	430 × 480 × 210 mm
Weight	11.9 kg
Input current/power consumption	12 V, 1.1 A / 13 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

ORDERING INFORMATION:	Cat. number
MR-12 with standard platform **PP-480**	BS-010130-AAI

3D, Sunflower Mini–Shaker

DESCRIPTION

"Sunflower" **3D** Mini–Shaker provides adjustable three-dimensional smooth rotation of the platform and is designed for mixing blood samples, for minigel staining and destaining, sample washing, blot hybridization reactions.

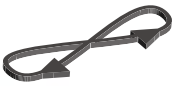
Mini–Shaker is a compact device with low energy consumption. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for more than 2 years.

Non–slip, temperature resistant, silicone mat located on the shaker's platform provides stable position for vessels during shaking. The platform is suitable for placing a versatile dimpled PDM mat for different size tubes.

Mini–Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Product video is available on the website

3D with a gel tank



3D — uni–rotation

SPECIFICATIONS

Speed control range	5–60 rpm
Fixed tilt angle	7°
Direct drive mechanism	
Max. continuous operation time	168 hrs
Maximum load	1 kg
Platform working area	215 × 215 mm
Overall dimensions (W × D × H)	235 × 235 × 140 mm with platform installed
Weight	1.2 kg
Input current/power consumption	12 V, 260 mA/ 3.1 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

PDM, dimpled mat

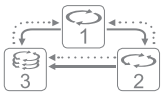
ACCESSORIES FOR THE STANDARD PLATFORM:

Optional dimpled mat PDM prevents different size tubes from rolling around the platform.

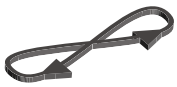
ORDERING INFORMATION:	Cat. number
3D with standard platform **Bio PP-4S**	BS-010151-AAG
Optional accessories:	
PDM dimpled mat	PDM

Multi Bio 3D, Mini Shaker

Product video is available on the website



3D Multi–rotation
Rocking uni–rotation



3D — uni–rotation

DESCRIPTION

Programmable mini-shaker **Multi Bio 3D** is designed for a variety of applications: hybridization reactions, cell growing, gel washing, soft extraction and homogenisation of biological components in solutions.

Multi Bio 3D provides realization of several types of motion in one module. This option of Biosan instruments essentially extends possibilities and enhances efficiency of preparation of test samples as well as allows selecting the mixing type according to individual requirements.

Microprocessor control allows performing not only ❶ Orbital 3D rotation of the platform, but also ❷ (Reciprocal 3D motion (of ping–pong type) as well as ❸ Soft vibrating rocking. These three motion types can be performed separately, pairwise and in cycles, periodically repeating the sequence of three motion types. The shaker is designed for laboratories with increased demands for quality of mixing, extraction and cell growing processes.

Non–slip, temperature resistant, silicone mat located on the shaker platform provides stable position for vessels during shaking. Optional dimpled PDM mat fixes tubes of different sizes.

Programmable shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Multi Bio 3D with PDM mat

PDM, dimpled mat

SPECIFICATIONS

❶ Speed control range	1–100 rpm (Orbital and reciprocal motion)
❷ Turning angle	0°–360° (increment 30°) (Reciprocal motion)
❸ Rocking angle	0°–5° (increment 1°) (Vibro motion)
Fixed platform tilt angle	7°
Orbit	22 mm
Platform working area	215 × 215 mm
Non–slip silicone mat is supplied as standard	
Maximum continuous operation time	24 hours
Time setting range for ❶ ❷	0–250 sec
Time setting range for ❸	0–5 sec
Number of cycles	0–125 times
Maximum load	1 kg
Overall dimensions (W × D × H)	235 × 235 × 140 mm with platform installed
Weight	1.8 kg
Input current/power consumption	12 V, 380 mA / 4.6 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

ACCESSORIES FOR THE STANDARD PLATFORM:

Optional dimpled mat **PDM** prevents different size tubes from rolling around the platform

ORDERING INFORMATION:	Cat. number
Multi Bio 3D with stand. platform **Bio PP-4S**	BS-010125-AAG
Optional accessories:	
PDM dimpled mat	PDM

PSU-10i, Orbital Shaker

DESCRIPTION

Shaker **PSU-10i** provides regulated orbital motion of the platform and is designed for use both in small specialized biotechnological laboratories and in large multidisciplinary laboratories: a choice of five (5) interchangeable platforms provides the possibility of performing various procedures and techniques.

Shaker **PSU-10i** incorporates a direct drive system, a brushless motor with a guaranteed service life up to 35,000 hours and an automatic loading balancing system. These innovations allow for continuous mixing up to 7 days, ensure reliable, trouble-free operation for more than 2 years and significantly expand the range of the device performance in both high and low limits.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Product video is available on the website

Ø 10 mm Orbit

SPECIFICATIONS

Speed control range	50–450* rpm (increment 10 rpm) ** max. speed depends on the load and vessels' shape*
Digital speed control	
Max. continuous operation time	168 hrs
Orbit	10 mm
Digital time setting	1 min–96 hrs / non–stop
Maximum load	3 kg
Overall dimensions (W×D×H)	220×205×90 mm
Weight	3.4 kg
Input current/power consumption	12 V, 800 mA / 9.6 W
External power supply	Input AC 100–240 V; 50/60Hz; Output DC 12 V

Platform Bio PP-4

Platform P-6/250

Platform Bio PP-4

ORDERING INFORMATION:	Cat. number
PSU-10i without platform	BS-010144-AAN
Optional accessories:	
UP-12 (with silicone mat)	BS-010108-AK
Bio PP-4 (with silicone mat)	BS-010116-AK
P-6/250	BS-010108-DK
P-12/100	BS-010108-EK
P-16/88	BS-010116-BK

Description and pictures of all platforms can be found on page 14

PSU-20i, Multi–functional Orbital Shaker

Multi–rotation

Platform PP-20/4

DESCRIPTION

Shaker **PSU-20**i provides three motion types: orbital, reciprocal and vibrating, which can be performed separately, pairwise and sequentially in repeated cycles. Shaker is designed for applications both in small specialized laboratories and in large multidisciplinary laboratories. PSU-20i is an ideal instrument for laboratories conducting research in biopharmaceutics and biomedicine.

Shaker **PSU-20i** is noiseless and reliable in operation, incorporates a direct drive system and brushless motor with a guaranteed service life up to 35,000 working hours. The use of direct drive and brushless motor allows for continuous mixing up to 7 days and ensures reliable operation for more than 2 years.

A choice of nine (9) different interchangeable platforms provides possibility of performing various procedures and techniques. Special attention should be paid to a multilevel platform, which allows accommodation of a large number of various microplates, Petri dishes, cultural bags and other low containers.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

SPECIFICATIONS

Speed control range 20–250* rpm (increment 5 rpm) ** max. speed depends on the load and vessels' shape*	
Digital speed control	
Max. continuous operation time	168 hrs
Orbit	20 mm
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Maximum load	8 kg
Overall dimensions (W×D×H)	410×410×130 mm
Weight	11.7 kg
Input current/power consumption	12 V, 3.2 A / 40 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

Motion types	Description	Speed range	Turning angle	Motion timer *	Digital time setting
❶ Orbital	Simple orbital motion with an option of shifting direction (clockwise/ anticlockwise) after set time	20–250 rpm	—	0–250 sec	1 min–96 hrs / non–stop (increment 1 min)
❷ Reciprocal	Orbital motion with shifting direction of rotation	20–250 rpm	0°–360° 30° increment)	0–250 sec	
❸ Vibrating	High speed, low amplitude motion	—	0°–5° (1° increment)	0–5 sec	

* for switching to the next motion in the cycle

Description and pictures of all platforms can be found on page 15

ORDERING INFORMATION: Cat. number

PSU-20i without platform BS-010145-ACI

Cat. numbers of all platforms can be found **on page 15**

Platforms for **PSU-10i and ES-20**

Platform	Description	Dimensions	Working Area	Cat. Number
❶ **UP-12** Used on PSU-10i, ES-20	Universal platform with adjustable bars for different types of flasks, bottles and beakers with silicone mat	285 × 220 × 40 mm	270 × 195 × 40 mm	BS-010108-AK
❷ **Bio PP-4** Used on PSU-10i	Flat platform with silicone mat for Petri dishes, culture flasks, agglutination cards	255 × 255 mm	230 × 230 mm	BS-010116-AK
❸ **PP-4** Used on ES-20	Metallic flat platform with silicone mat	220 × 220 mm	215 × 215 mm	BS-010108-BK
❹ **P-12/100** Used on PSU-10i, ES-20	Platform with clamps for flasks, 100–150 ml (12 places)	250 × 190 mm	250 × 190 mm	BS-010108-EK
❺ **P-6/250** Used on PSU-10i, ES-20	Platform with clamps for flasks, 250–300 ml (6 places)	250 × 190 mm	250 × 190 mm	BS-010108-DK
❻ **P-16/88** Used on PSU-10i, ES-20	Platform with spring holders for up to 88 tubes up to 30 mm diameter (e. g. 10 ml, 15 ml, 50 ml tubes)	275 × 205 × 75 mm	275 × 205 × 75 mm	BS-010116-BK

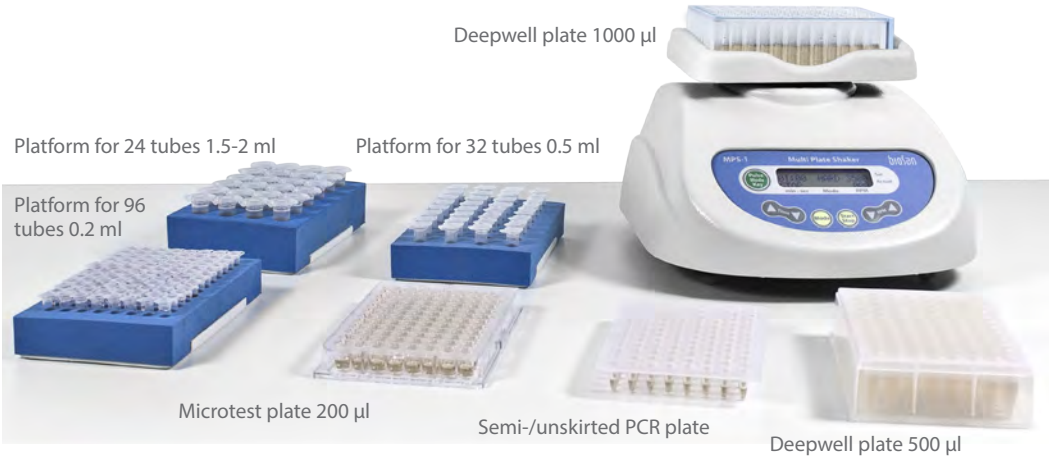
Platforms for PSU-20i and ES-20/60

Platform	Description	Dimensions	Working Area	Cat. number
1 **UP-330** Used on PSU-20i	Universal platform with adjustable bars for different types of flasks, beakers	345 × 430 × 105 mm	300 × 400 × 80 mm	BS-010145-AK
2 **P-30/100** Used on PSU-20i, ES-20/60	Platform with 30 clamps for 100 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-BK
3 **P-16/250** Used on PSU-20i, ES-20/60	Platform with 16 clamps for 250 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-CK
4 **P-9/500** Used on PSU-20i, ES-20/60	Platform with 9 clamps for 500 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-AK
5 **P-6/1000** Used on PSU-20i, ES-20/60	Platform with 6 clamps for 1000 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-DK
6 **PP-400** Used on ES-20/60	Flat platform with non–slip silicone mat	360 × 400 mm	400 × 360 mm	BS-010135-FK
7 **UP-168** Used on PSU-20i, ES-20/60	Universal platform for different flasks (Clamps ordered separately)	360 × 400 mm	360 × 400 mm	BS-010135-JK
7.1 **FC-100** 7.2 **FC-250** 7.3 **FC-500** 7.4 **FC-1000**	Clamp for 100, 250, 500, 1000ml flask (for UP-168)	Ø 65mm Ø 85mm Ø105mm Ø130mm		BS-010126-HK BS-010126-JK BS-010126-LK BS-010126-IK
8.4 **PP-20/4** Used on PSU-20i	Four-level flat platform with non–slip rubber mat	380 × 480 × 510 mm	365 × 465 × 510 mm	BS-010126-EK
8.3 **PP-20/3** Used on PSU-20i	Three-level flat platform with non–slip rubber mat	380 × 480 × 340 mm	365 × 465 × 340 mm	BS-010126-DK
8.2 **PP-20/2** Used on PSU-20i	Two-level flat platform with non–slip rubber mat	380 × 480 × 170 mm	365 × 465 × 170 mm	BS-010126-CK
8.1 **PP-20** Used on PSU-20i	One-level flat platform with non–slip rubber mat	380 × 480 mm	365 × 465 mm	BS-010126-BK

MPS-1, Multi Plate Shaker

NEW PRODUCT

SHAKER FOR VARIOUS APPLICATIONS


Deepwell plate 1000 µl
Platform for 24 tubes 1.5-2 ml
Platform for 32 tubes 0.5 ml
Platform for 96 tubes 0.2 ml
Microtest plate 200 µl
Semi-/unskirted PCR plate
Deepwell plate 500 µl

DESCRIPTION

High–Speed Multi Plate Shaker **MPS-1** can be used in virtually any application by providing adjustable mixing of reagents in microtest plates, PCR plates, deepwell plates and test tubes (shaking tubes 0.2 to 2 ml and vortexing any volume up to 50 ml).

The shaker is compact and user–friendly. The shaker is ideal for personal use.

MPS-1 features a head for vortexing a single tube.

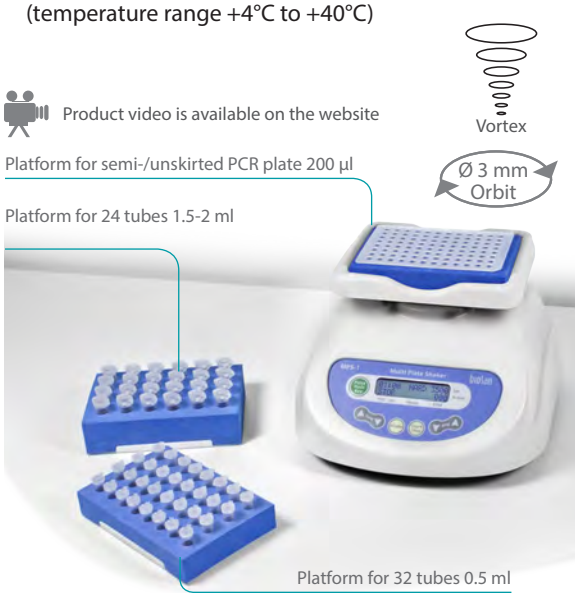
Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

MPS-1 features **Pulse Mode** mixing function that works on the principle of giving a periodic impulse: the tube is accelerated to the set speed, holds it for 3 seconds and then drops the speed to zero. This motion is repeated until the timer runs out. This method provides a constant state of resuspension of the particles inside a tube, as the acceleration is always changing. The advantage of this method is the high throughput of mixed samples compared to vortexing a single tube.

FEATURES

- Speed control range 300–3,200 rpm
- Smooth mixing with 3 mm orbit
- Mixing presets
- **Pulse Mode** mixing function
- Quiet operation — low noise at maximum speed
- High stability — stationary at maximum speed
- Universal platform holder for Deepwell plates and Microtest plates
- Additional platforms for semi- and unskirted PCR plates 200 µl as well as for tubes from 0.2 to 2 ml
- Can be used in cold rooms or incubators (temperature range +4°C to +40°C)

Product video is available on the website



MPS-1, Multi Plate Shaker

SPECIFICATIONS

Vortexing a 50 ml tube

Vortexing a 15 ml tube

Mixing Speed control range	300–3,200 rpm (100 rpm increment)
Platform options:	
– For semi-\unskirted PCR plate or 96 microtest tubes 0.2 ml	**P-02/96**
– For 24 microtest tubes 1.5-2 ml	**P-2/24**
– For 32 microtest tubes 0.5 ml	**P-05/32**
– For 24 microtest tubes 0.5 ml and 48 microtest tubes 0.2 ml	**P-02/05**
– Universal platform for deepwell plates, 96-well microtest plates (U, V or flat bottomed), 384-well microtest plates	
Types of mixing presets:	
VORTEX	3,200 rpm
HARD	2,600 rpm
MEDIUM	1,800 rpm
SOFT	1,000 rpm
CUSTOM	adjustable rpm
Features a **Pulse Mode** mixing function	
Features a Vortex function	
Maximum load	0.3 kg
Mixing Orbit	3 mm
Acceleration time to maximum speed	5 sec
Digital time setting	0–60 min (15 sec increment)/ non–stop
Maximum continuous operation time	8 hrs
Noise level, not more	65 dB
Weight	5.1 kg
Overall dimensions (W × D × H)	225 × 215 × 150 mm
Input current/power consumption	12 V, 800 mA / 10 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

APPLICATIONS OF UNIVERSAL BUILD IN PLATFORM

Deepwell plate 96/1000 µl

Microtest plate 200 µl

Deepwell plate 96/500 µl

ORDERING INFORMATION: Cat. number

MPS-1 Multi Plate Shaker with built-in universal platform BS-010216-A03

Optional platforms:		Cat. number
❶ **P-02/96**	For semi-\unskirted PCR plate or 96 microtest tubes 0.2 ml	BS-010216-CK
❷ **P-2/24**	For 24 microtest tubes 1.5-2 ml	BS-010216-AK
❸ **P-05/32**	For 32 microtest tubes 0.5 ml	BS-010216-BK
❹ **P-02/05**	For 24 microtest tubes 0.5 ml and 48 microtest tubes 0.2 ml	BS-010216-DK

❶ Platform **P-02/96**

❷ Platform **P-2/24**

❸ Platform **P-05/32**

❹ Platform **P-02/05**

PSU-2T, Mini–Shaker

DESCRIPTION

Mini–Shaker **PSU-2T** is designed for immunoassays and provides adjustable mixing of reagents in microplates. The device ensures smooth movement of the platform even at low speeds.

Shaker is a compact and user-friendly device. It takes up little space on a desk and is ideal for personal use. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for more than 2 years. Display of the device switches between time and speed readings.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Ø 2 mm Orbit

Product video is available on the website

SPECIFICATIONS

Speed control range	150–1,200 rpm
Digital time setting	1 min–24 hrs / non–stop
Digital setting and control of time and speed	
Max. continuous operation time	168 hrs
Direct drive mechanism	
Orbit	2 mm
Overall dimensions (W × D × H)	220 × 205 × 90 mm
Weight	2 kg
Input current/ power consumption	12 V, 280 mA / 3.4 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

Platforms for microtest plates:

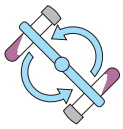
Ⓐ **IPP-2** (standard platform) for 2 microtest plates	184 × 132 mm
Ⓑ **IPP-4** (optional platform) for 4 microtest plates	266 × 170 mm

Ⓐ Platform IPP-2

Ⓑ Platform IPP-4

ORDERING INFORMATION:	Cat. number
PSU-2T with stand platform IPP-2	BS-010155-AAG
Optional platforms:	
IPP-4	BS-010102-AK

Bio RS-24, Mini–Rotator



Vertical rotation 360°

Product video is available on the website

Bio RS-24 in operation

Mini-rotator **Bio RS-24** provides vertical rotation of the platform. The rotator is an ideal instrument for preventing blood coagulation in tubes and for fulfilment of procedures of biological components extraction.

The device is simple to operate; it is designed as a low cost solution.

Rotator can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

DESCRIPTION

SPECIFICATIONS

Speed control range	5–30 rpm
Vertical rotation movement	overhead, 360°
Digital time setting	1 min–24 hrs / non–stop (increment 1 min)
Maximum continuous operation time	8 hours
Overall dimensions (W×D×H)	325×190×155 mm
Weight	1.4 kg
Recomended load	75% of the rated volume
Input current/power consumption	12 V, 110 mA/1.3 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

ORDERING INFORMATION:	Cat. number
Bio RS-24 with standard platform PRS-22	BS-010133-AAG
Optional platforms:	
PRS-22	BS-010117-FK
PRS-4/12	BS-010117-AK
PRSC-18	BS-010117-EK

Platform	Capacity	Tube Volume	Tube Diameter Ø
❶ **PRS-22** (standard)	22	1.5–15 ml	10–16 mm
❷ **PRS-4/12** (optional)	4 and 12	up to 50 and 1.5–15 ml	20–30 mm and 10–16 mm
❸ **PRSC-18** (optional)	18	15 ml	10–16 mm

PRS — series platforms are equipped with universal rubber clamps for different size tube fixation;
PRSC — series platforms have metal clamps able to hold heavier solutions (e.g. soil, sand).

❶ PRS-22

❷ PRS-4/12

❸ PRSC-18

Multi Bio RS-24, Multi-Rotator

DESCRIPTION

Programmable Rotator **Multi Bio RS-24** performs several motion types in one module. Microprocessor control allows performing not only ❶ **Vertical rotation** of the platform, but also ❷ **Reciprocal rotation** as well as ❸ **Vibration**. These three motion types can be performed separately, pairwise and in cycles, periodically repeating the sequence of three motion types. Multi–Rotation option of Biosan instruments substantially expands possibilities and enhances efficiency of sample preparation for the examined materials and allows adjusting the mixing procedure according to the individual tasks.

Programmable Rotator can be used for variety of applications in modern life science laboratories: for hybridization reactions, cell growing, soft extraction and homogenisation of biological components in solutions, as well as for reactions of binding and washing of magnetic particles.

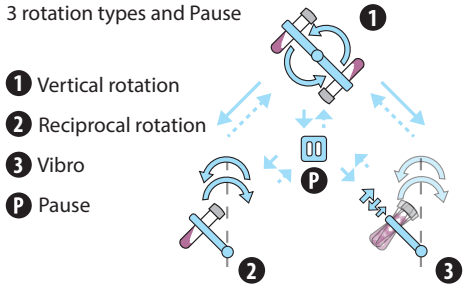
Programmable Rotator can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

Product video is available on the website

SPECIFICATIONS

❶ Vertical rotation:	
Speed control range	1–100 rpm (increment 1 rpm)
Vertical rotation movement	overhead, 360°
Time setting range	0–250 sec
❷ Reciprocal rotation:	
Speed control range	1–100 rpm (increment 1 rpm)
Tilt angle range	1°–90° (increment 1°)
Time setting range	0–250 sec
❸ Vibro rotation:	
Tilt angle range	0°–5° (increment 1°)
Pause / Vibro time setting range	0–5 sec
General specifications:	
Digital time setting	1 min–24 hrs / non–stop (increment 1 min)
Maximum load	0.5 kg
Overall dimensions (W×D×H)	365×195×155 mm
Weight	1.7 kg
Input current/power consumption	12 V, 660 mA / 8 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

Programmable Rotator provides 3 rotation types and Pause



NEW FUNCTION

During the stop mode the platform does not perform extra turnover and stops in a horizontal plane. Additionally there is a possibility of setting the plane with respect to which platform oscillates vertically or horizontally.

ORDERING INFORMATION:

	Cat. number
Multi Bio RS-24 with standard platform PRS-26	BS-010117-AAG
Optional platforms:	
PRS-5/12	BS-010117-HK
PRS-10	BS-010117-IK
PRSC-22	BS-010117-LK
PRSC-10	BS-010117-JK
PRS-1DP	BS-010149-DK

Multi Bio RS-24 with optional platform PRSC-22

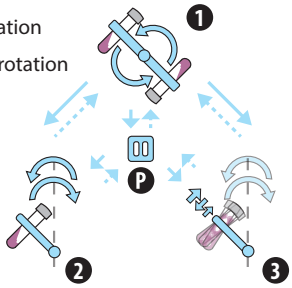
Description and pictures of all platforms can be found on page 22

Multi RS-60, Multi Rotator

Product video is available on the website

Programmable Rotator provides 3 rotation types and Pause

❶ Vertical rotation
❷ Reciprocal rotation
❸ Vibro
Ⓟ Pause



NEW FUNCTION

During the stop mode the platform does not perform extra turnover and stops in a horizontal plane. Additionally there is a possibility of setting the plane with respect to which platform oscillates vertically or horizontally.

Multi RS-60 with standard platform PRS-48

Description and pictures of all platforms can be found on page 22

DESCRIPTION

Programmable Rotator **Multi RS-60** performs several motion types in one module. Microprocessor control allows performing not only ❶ **Vertical rotation** of the platform, but also ❷ **Reciprocal rotation** as well as ❸ **Vibration**. These three motion types can be performed separately, pairwise and in cycles, periodically repeating the sequence of three motion types. Multi–rotation option of Biosan instruments substantially expands possibilities and enhances efficiency of sample preparation for the examined materials and allows adjusting the mixing procedure according to the individual tasks.

Programmable Rotator can be used for variety of applications in modern life science laboratories: for hybridization reactions, cell growing, soft extraction and homogenisation of biological components in solutions, as well as for reactions of binding and washing of magnetic particles.

SPECIFICATIONS

❶ Vertical rotation:	
Speed control range	1–100 rpm (increment 1 rpm)
Vertical rotation movement	overhead, 360°
Time setting range	0–250 sec
❷ Reciprocal rotation:	
Speed control range	1–100 rpm (increment 1 rpm)
Tilt angle range	1°–90° (increment 1°)
Time setting range	0–250 sec
❸ Vibro rotation:	
Tilt angle range	0°–5° (increment 1°)
Pause / Vibro time setting range	0–5 sec
General Specifications:	
Digital time setting	1 min–24 hrs / non–stop (increment 1 min)
Maximum load	0.8 kg
Overall dimensions (W×D×H)	430×230×230 mm
Weight	3.8 kg
Input current/power consumption	24 V, 750 mA / 18 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 24 V

ORDERING INFORMATION:	Cat. number
Multi RS-60 with standard platform PRS-48	BS-010118-AAI
Optional platforms:	
PRS-8/22	BS-010118-AK
PRS-14	BS-010118-BK

Platforms for Multi Bio RS-24

Standard:	Capacity	Tube Volume	Tube Diameter	Cat. number
1 **PRS-26**	26	1.5–15 ml	10–16 mm	BS-010117-GK
Optional				
2 **PRS-5/12**	5 and 12	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010117-HK
3 **PRS-10**	10	up to 50 ml	20–30 mm	BS-010117-IK
4 **PRSC-22**	22	15 ml	10–16 mm	BS-010117-LK
5 **PRSC-10**	10	50 ml	20–30 mm	BS-010117-JK
6 **PRS-1DP**	Platform for microplates and racks for tall tubes 0.5 and 1 ml (e.g. Thermo 3741MTX, 3742MTX, 3744MTX)			BS-010149-DK

1 PRS-26

2 PRS-5/12

3 PRS-10

4 PRSC-22

5 PRSC-10

6 PRS-1DP

Clamps on PRSC-10

PRS — series platforms are equipped with universal rubber clamps for different size tube fixation;

PRSC — series platforms have metal clamps able to hold heavier solutions (e.g. soil, sand).

Platforms for Multi RS-60

Standard:	Capacity	Tube Volume	Tube Diameter	Cat. number
1 **PRS-48**	48	1.5–15 ml	10–16 mm	BS-010118-CK
Optional				
2 **PRS-8/22**	8 and 22	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010118-AK
3 **PRS-14**	14	up to 50 ml	20–30 mm	BS-010118-BK

1 PRS-48

2 PRS-8/22

3 PRS-14

V-1 plus, Vortex

Vortex

Vortex **V-1 plus** is an ideal instrument for gentle mixing to vigorous resuspending of cells and biological and chemical liquid components in tubes using eccentric mechanism.

Vortex has two modes:

1. Continuous operation;
2. Impulse operation (activated by pressing the cap with the tube's bottom).

Eccentric mixing principle	
Speed control range	750–3,000 rpm
Mixing module for tubes	from 1.5 to 50 ml
Maximum mixing volume	30 ml
Orbit	4 mm
Overall dimensions (W × D × H)	90 × 150 × 80 mm
Weight	0.8 kg
Input current/power consumption	12 V, 320 mA / 3.8 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V

ORDERING INFORMATION:	Cat. number
V-1 plus	BS-010203-AAG

V-32, Multi-Vortex

DESCRIPTION

Multi-Vortex **V-32** is intended for intensive stirring of bacterial and yeast cell, washing from the culture medium and extraction of metabolites and enzymes from cells and cell cultures.

It is different from V-1 by the possibility of mixing up to 32 tubes simultaneously.

Vortex is applicable for:

- Performing various DNA operations — deproteinisation of DNA/ protein complexes;
- Purification of low-molecular DNA/RNA fragments in PCR-diagnostic.

Multi-Vortex has two operation modes:

1. Continuous operation;
2. Impulse operation.

V-32 is supplied with a 32-socket universal platform for Eppendorf type tubes up to 1.5 ml (1.5/0.5/0.2 ml — 16/8/8 sockets) and **PL-1** platform for mixing single tube up to 15 ml.

An optional 6-socket platform **PV-6/10** for 10 ml tubes (max. tube diameter 15 mm) can be supplied on request.

Platform PV-32

SPECIFICATIONS

Speed control range	500–3,000 rpm
Acceleration time	3 sec
Orbit	2 mm
Continuous / impulse operation	
Maximum load	70 gr
Maximum continuous operation time	8 hrs
Dimensions	120×180×100 mm
Weight	1.5 kg
Input current/power consumption	12 V, 320 mA / 3.8 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V

Platform PV-48 NEW PLATFORM

ORDERING INFORMATION:	Cat. number
V-32 with standard platforms PL-1 and PV-32	BS-010207-AAG
Optional platforms:	
PV-6/10 optional platform	BS-010207-BK
PV-48 optional platform	BS-010207-GK

Platform PV-6/10

Platform PL-1

MSV-3500, Multi Speed Vortex

MSV-3500
with platform SV-8/15

Vortex

Ø 4 mm
Orbit

MSV-3500 with platform SV-4/30

DESCRIPTION

Multi Speed Vortex **MSV-3500** is designed for soft or intensive mixing of reagents in different size and type plastic tubes (0.2 to 50 ml).

It is designed for operation in life science laboratories working in the fields of biochemistry, cell and molecular biology.

Unit has four types of interchangeable platforms: for Eppendorf type microtest tubes, 10/15/50 ml tubes (diameter 12/16/30 mm). Platforms can be ordered separately or as one set with **MSV-3500**.

Speed and time are under microprocessor control. LCD display indicates two lines of values: the set and actual values of speed and time.

Unit provides high maximum speed of platform rotation efficiently mixing microvolumes (less than 5 µl) of samples.

SPECIFICATIONS

Speed control range	300–3,500* rpm * Maximum speed depends on load
Digital time setting	0–60 min / non-stop (increment 1 min)
Display	LCD, 2×16 signs
Orbit	4 mm
Maximum load	0.2 kg
Maximum continuous operation time	8 hrs
Dimensions	180×170×145 mm
Weight	2.6 kg
Input current/power consumption	12 V, 1 A / 12 W
External power supply	Input AC 100–240 V, 50/60 Hz;

ORDERING INFORMATION:	Cat. number
MSV-3500 with all 4 platforms	BS-010210-TAH
MSV-3500 without platform	BS-010210-AAH
Optional platforms: see table below	

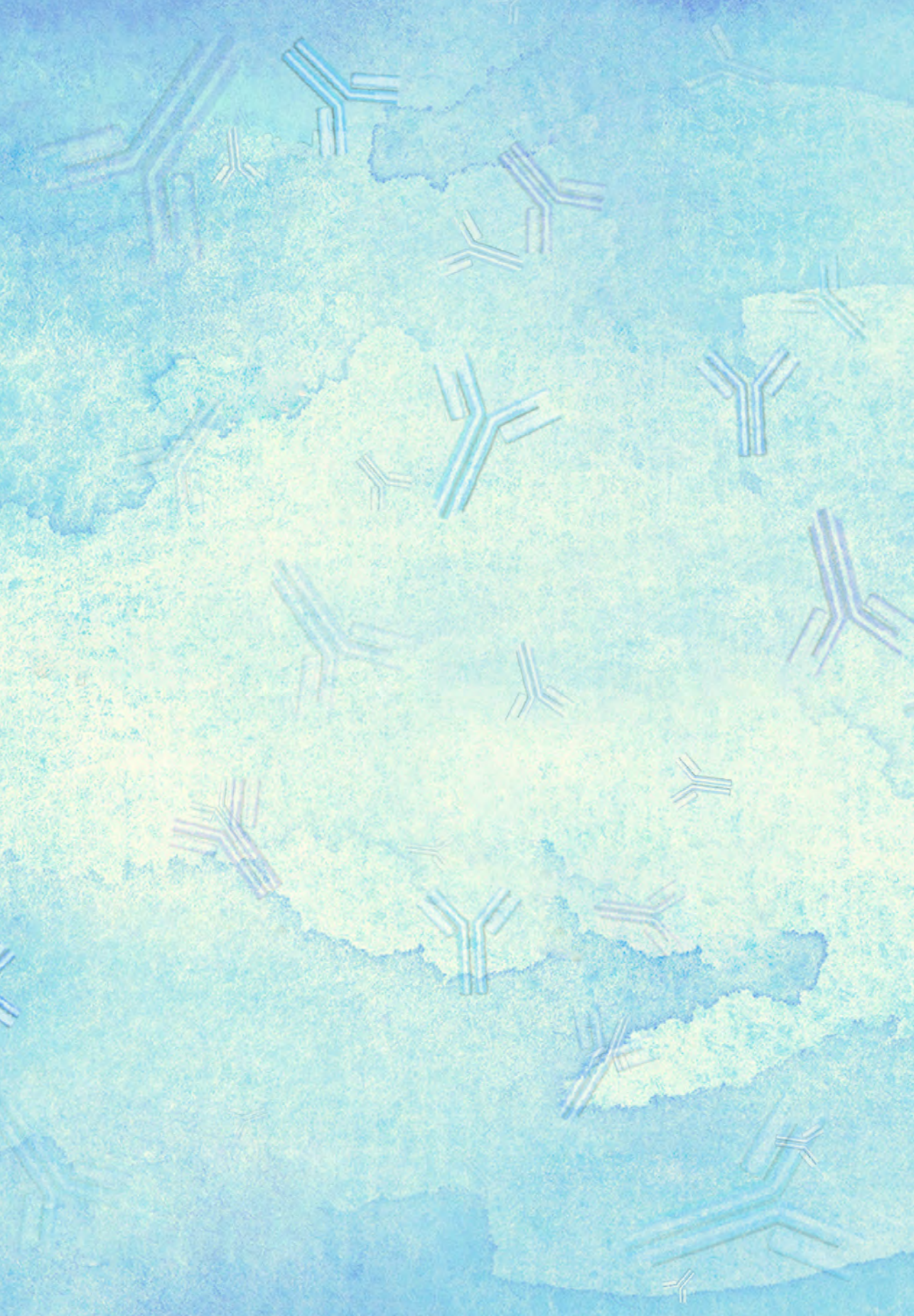
Optional platforms:		Cat. Number
❶ **SV-16/8**	Platform for 16×1.5 ml + 8×0.5 ml + 8×0.2 ml microtubes, Ø 11/8/6 mm	BS-010210-CK
❷ **SV-10/10**	Platform for 10×10 ml tubes 12 mm diameter	BS-010210-BK
❸ **SV-8/15**	Platform for 8×15 ml tubes 16 mm diameter	BS-010210-DK
❹ **SV-4/30**	Platform for 4×50 ml tubes 30 mm diameter	BS-010210-AK

❶ SV-16/8

❷ SV-10/10

❸ SV-8/15

❹ SV-4/30



CATALOGUE 2015-2016

THERMO–SHAKERS

PST-60HL, PST-60HL-4 and PST-100HL Thermo–Shakers

DESCRIPTION

Plate Thermo–Shakers are designed for shaking and thermostating 1–4 standard 96-well microplates.

A multisystem principle, used in design of the Thermo–Shaker, allows operating it as 3 independent devices:

- Incubator;
- Microplate shaker;
- Thermo–Shaker.

A distinctive feature of Biosan Plate Thermo–Shakers is the patented by the company **Two-Side Microplates Heating**, which allows to achieve full correspondence of the set and actual temperature in the microplate wells.

Standard versions of thermo-shakers provide heating up to 60°C, which is sufficient for carrying out ELISA tests.

Thermo-shaker **PST-100HL** with the ability to stabilize the temperature up to 100 ° C is specially designed for the hybridization reactions.

PST-60HL

Ø 2 mm Orbit

PST-60HL-4

Ø 2 mm Orbit

PST-100HL

Ø 2 mm Orbit

PLATE SHAKER–THERMOSTAT PROVIDES:

- Soft or intensive sample shaking
- Rotation speed regulation, stabilization and indication
- Even rotation amplitude throughout the Thermo-Shaker platform
- Required operation time setting and indication
- Automatic stopping of the platform movement after expiration of the set time
- Setting and indication of the required temperature on the platform
- Automatic fault diagnostics (temperature sensor, platform heating, lid heating etc.).

NEW FUNCTION

APPLICATION FIELDS:

Cytochemistry — for in situ reactions
Immunochemistry — for ELISA reactions
Biochemistry — for enzyme and protein analysis
Molecular biology — for micro array analysis

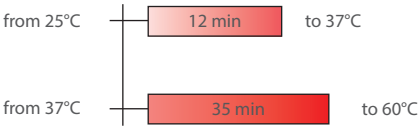
ORDERING INFORMATION:	Cat. number
PST-60HL	BS-010119-AAI
PST-60HL-4	BS-010128-AAI
PST-100HL	BS-010142-AAI

Product video is available on the website

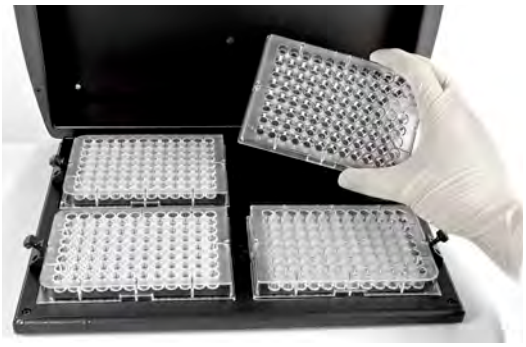
PST-60HL, PST-60HL-4 and PST-100HL Thermo–Shakers

Specifications	PST-60HL	PST-60HL-4	PST-100HL
Temperature setting range	+25°C... +60°C		+25°C... +100°C
Temperature control range	+5°C above ambient... +60°C		+5°C above ambient... +100°C
Temperature setting resolution	0.1°C		
Temperature stability	±0.1°C		
Temperature uniformity @ +37°C	±0.25°C	±0.25°C	±0.2°C
Double heating contour of the platform and heated lid			
Orbit	2 mm		
Speed regulation range	250–1,200 rpm (increment 10 rpm)		
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)		
Display	LCD, 16×2 signs		
Max. height of microtest plate	18 mm		
Number of microtest plates	2	4	2
Weight	6.1 kg	8.8 kg	5.9 kg
Platform dimensions (W×D)	250×150 mm	210×290 mm	250×150 mm
Overall dimensions (W×D×H)	270×260×125 mm	380×390×140 mm	270×260×125 mm
Input current/power consumption	12 V DC, 3.3 A / 40 W	12 V DC, 4.15 A / 50 W	12 V, 5 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V		

HEAT UP TIME PST-60HL AND PST-60HL-4



PST-60HL-4



HEAT UP TIME PST-100HL

PST-60HL

TS-100, Thermo–Shaker

DESCRIPTION

Thermo–Shaker **TS-100** provides intensive mixing and temperature control of samples in microtest tubes or PCR plate. Functions of heating (up to +100°C) and mixing can be performed both simultaneously and independently, i.e. the unit implements three devices in one:

- Shaker;
- Dry–block Thermostat;
- Thermo–Shaker.

TS-100 is used for DNA analysis sample preparation, for extraction of proteins, polysaccharides, lipids and other cellular components. Features of **TS-100** meet the increased requirements of the user, including:

- Quickly reaches the set mixing speed and maintains same amplitude of rotation around the block;
- Stable maintenance of the temperature of a wide range over the entire surface of the block;
- LCD display shows the set and actual temperature, speed and time;
- Quiet engine operation, compact size, long service life.

Heating source is a printed heating board (12 V). Mixing is provided by movement of orbital type.

The instrument is applicable in:

- Genetic analysis — in extraction of DNA, RNA and further sample preparation;
- Biochemical study of enzymatic reactions and processes;
- Extraction of metabolites from cellular material.

Product video is available on the website

Mixing Efficiency Video is available on the website

HEAT UP TIMES FOR TS-100

TEMPERATURE CALIBRATION FUNCTION

With the help of the temperature calibration function the user can calibrate the unit approx. ±6% of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers.

TS-100 with block SC-24

SPECIFICATIONS

Temperature setting range	+25°C ... +100°C
Temperature control	5°C above ambient ... +100°C range
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature accuracy @ +37°C	±0.5°C
Average heating speed	4°C/min from +25°C to +100°C
Temperature uniformity over the block: @ +37°C @ +60°C @ +100°C	 ±0.1°C ±0.2°C ±0.2°C
Temperature calibration coefficient range	0.936...1.063 (± 0.063)
Speed control range	250–1,400 rpm
Acceleration time	3 sec
Orbit	2 mm
Microprocessor controlled temperature, mixing speed and operation time	
Display	LCD, 16×2 signs
Digital time setting	1 min–96 hrs (1 min increment)
Maximum continuous operation time	max. 96 hours
Overall dimensions (W×D×H)	205×230×130 mm
Weight	3.2 kg
Input current/power consumption	12 V, 3.5 A / 42 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

ORDERING INFORMATION:

	Cat. number
TS-100 without block	BS-010120-AAI

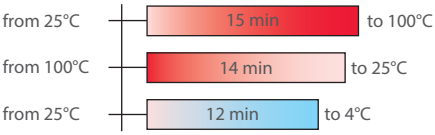
Catalogue numbers and descriptions of all blocks can be found on page 32

TS-100C, Thermo–Shaker

Product video is available on the website

Mixing Efficiency Video is available on the website

HEAT UP AND COOL DOWN TIMES FOR TS-100C



TEMPERATURE CALIBRATION FUNCTION

With the help of the temperature calibration function the user can calibrate the unit approx. ±6% of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers.

TS-100C with block SC-96AC

ORDERING INFORMATION:

	Cat. number
TS-100C without block	BS-010143-AAI

Catalogue numbers and descriptions of all blocks can be found on page 32

DESCRIPTION

Thermo–Shaker **TS-100C** provides intensive mixing and temperature control of samples in microtest tubes or PCR plate. This model of Thermo–Shaker differs from TS-100 with a possibility of cooling samples down to +4°C. Features of **TS-100C** meet the highest expectations of users according to many parameters:

1. Fast reaching of specified mixing speed and maintenance of equal amplitude of rotation throughout the Thermo–Shaker block;
2. Stability of maintaining the preset temperature in a wide range throughout the Thermo–Shaker's block surface;
3. LCD display indicates preset and current values of temperature, speed and time of operation;
4. Quiet motor operation, compact size, prolonged service life.

Functions of heating and mixing can be performed both simultaneously and independently

There are five heating and cooling blocks available, including a block with a plastic lid for the PCR-plates. All blocks are mutually interchangeable and can be easily installed on Thermo–Shaker. Pictures and description of the blocks are provided on the page 32.

The instrument is applicable in:

- Genetic analysis — in extraction of DNA, RNA and further sample preparation;
- Biochemical study of enzymatic reactions and processes;
- Extraction of metabolites from cellular material.

SPECIFICATIONS

Temperature setting range		+4°C... +100°C
Temperature control range		15°C below ambient... +100°C
Temperature setting resolution		0.1°C
Temperature stability		±0.1°C
Temperature accuracy @ +37°C		±0.5°C
Temperature uniformity over the block:	@ +4°C	±0.6°C
	@ +37°C	±0.1°C
	@ +100°C	±0.3°C
Average heating speed: from +25°C to +100°C		5°C/min
Average cooling speed: from +100°C to +25°C		5°C/min
from +25°C to +4°C		1.8°C/min
Temperature calibration coefficient range		0.936...1.063 (± 0.063)
Speed control range		250–1,400 rpm
Acceleration time		3 sec
Orbit		2 mm
Display		LCD, 16×2 signs
Microprocessor controlled temperature, mixing speed and operation time		
Digital time setting		1 min–96 hrs (1 min increment)
Maximum continuous operation time		max. 96 hours
Overall dimensions (W×D×H)		205×230×130 mm
Weight		3.7 kg
Input current/power consumption		12 V, 4.9 A / 60 W
External power supply		Input AC 100–240 V 50/60 Hz; Output DC 12 V

Interchangeable Blocks for TS-100

Optional Blocks:		Tube volume	Cat. number
1 **SC-18**	20 and 12 microtubes	0.5 ml and 1.5 ml	BS-010120-AK
2 **SC-18/02**	20 and 12 microtubes	0.2 ml and 1.5 ml	BS-010120-CK
3 **SC-24**	24 microtubes	2 ml	BS-010120-EK
4 **SC-24N**	24 microtubes	1.5 ml	BS-010120-GK
5 **SC-96A**	96-well microplate (0.2 ml) for PCR		BS-010120-FK

1 SC-18

2 SC-18/02

3 SC-24

4 SC-24N

5 SC-96A

Interchangeable Blocks for TS-100C

Optional Blocks:		Tube's volume	Cat. number
1 **SC-18C**	20 and 12 microtubes	0.5 ml and 1.5 ml	BS-010143-AK
2 **SC-18/02C**	20 and 12 microtubes	0.2 ml and 1.5 ml	BS-010143-CK
3 **SC-24C**	24 microtubes	2 ml	BS-010143-EK
4 **SC-24NC**	24 microtubes	1.5 ml	BS-010143-GK
5 **SC-96AC**	96-well microplate (0.2 ml) for PCR		BS-010143-FK

1 SC-18C

2 SC-18/02C

3 SC-24C

4 SC-24NC

5 SC-96AC

TS-DW, Thermo–Shaker for deep well plates

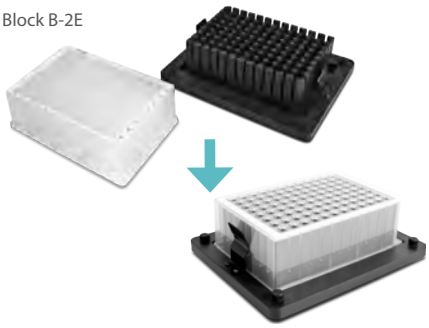
NEW PRODUCT

❷ Block B-2S

Product video is available on the website

The block for deepwell plate is mountable, thus a custom plate module can be manufactured on request

❶ Block B-2E



SEPARATE BLOCKS TO ACCOMMODATE DIFFERENT DEEPWELL PLATES WILL BE RELEASED FOR EXAMPLE:

Deep Well Plates NUNC ®	96/2000 µl
Deep Well Plates Axygen®	96/0.6 ml
Deep Well Plates Eppendorf®	96/0.5 ml

APPLICATION FIELDS:

Cytochemistry — for in situ reactions

Immunochemistry — for immunofermentative reactions

Biochemistry — for enzyme and protein analysis

Molecular biology — for nucleic acid extraction

DESCRIPTION

TS-DW Thermo–Shaker is designed for shaking and incubating deep well plates.

A multisystem principle, used in the design of the Thermo–Shaker, allows operating it as 3 independent devices: Incubator, Plate shaker and Thermo–Shaker.

TS-DW provides excellent temperature uniformity across the plate due to patented two-sided heating of the block and the lid, contour heating of the block and close proximity of heating elements to plate walls.

There is a number of interchangeable blocks to suit different plates such as Eppendorf® 96/1000 µl, Sarstedt® Megablock 96/2200 µl, Porvair® 96/2000 µl, Axygen® 96/2200 µl. Also we can manufacture a customized block on request.

DEEP WELL PLATE THERMO–SHAKER PROVIDES:

- Soft or intensive sample shaking
- Rotation speed regulation, stabilization and indication
- Even rotation amplitude throughout the Thermo-Shaker platform
- Exceptional temperature uniformity across the plate
- Required operation time setting and indication
- Automatic stopping of the platform movement after expiration of the set time
- Setting and indication of the required temperature on the platform
- A variety of changeable blocks that can accommodate most popular deepwell plates

SPECIFICATIONS

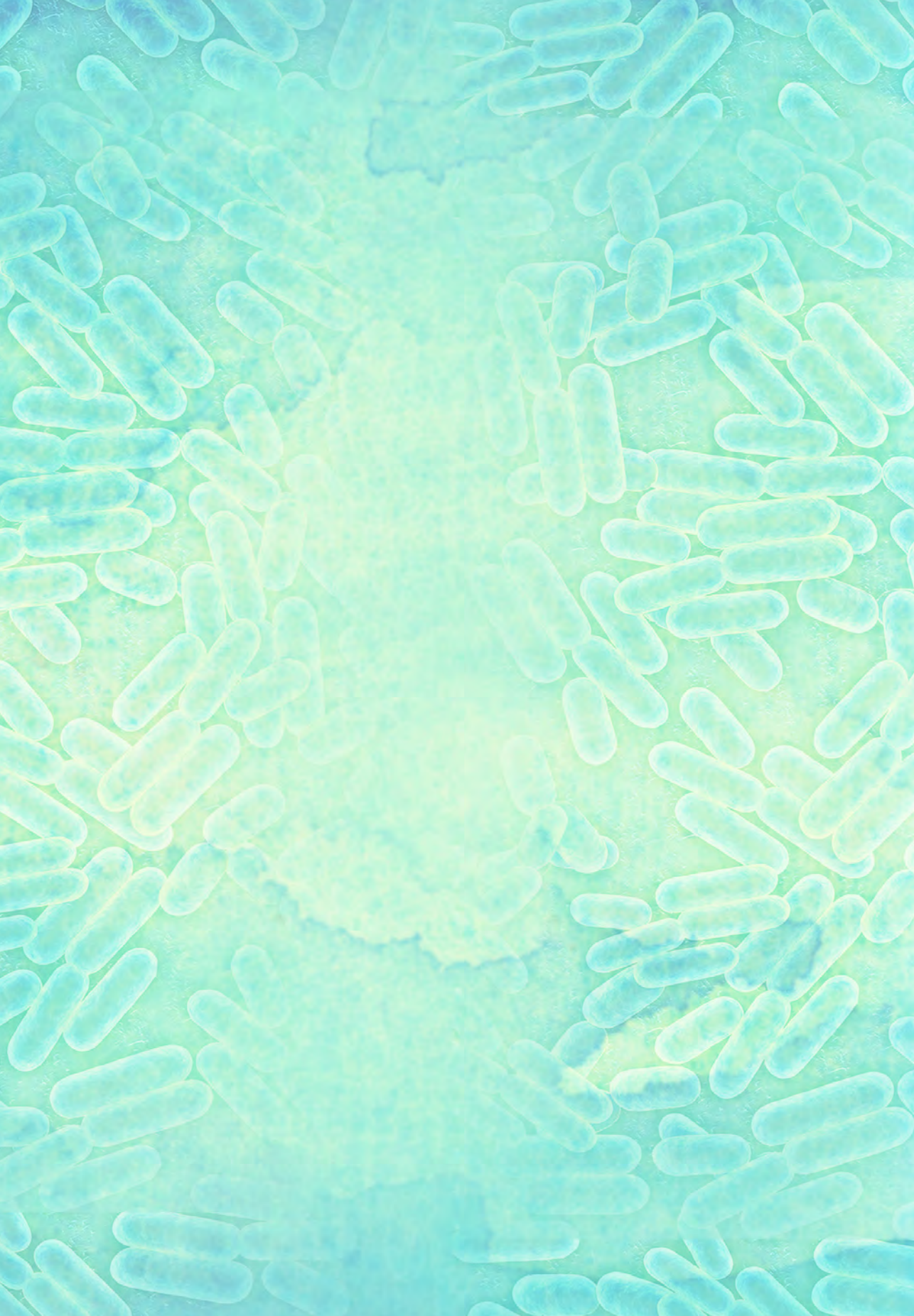
Temperature setting range	+25°C ... +100°C
Temperature control range	5°C above ambient ... +100°C
Temperature setting resolution	0.1°C
Temperature uniformity @ +37°C	±0.1°C*
Temperature accuracy @ +37°C	±0.5°C*
Time of platform heating from +25°C to +37°C	6 min*
Speed control range	250–1,400 rpm
Orbit	2 mm
Display	LCD, 16×2 signs
Digital time setting	1 min–96 hrs (1 min increment)
Overall dimensions (W×D×H)	240×260×160 mm
Weight	5.1 kg
Input current/power consumption	12 V, 4.8 A / 58 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

*For B-2E thermoblock

ORDERING INFORMATION:	Cat. number
TS-DW without block	BS-010159-A02

Interchangeable Blocks:		Cat. number
❶ **B-2E**	Block for one deep-well plate Eppendorf® 96/1000 µl	BS-010159-AK
❷ **B-2S**	Block for one deep-well plate Sarstedt® Megablock 96/2200 µl	BS-010159-CK
❸ **B-2P**	Block for one deep-well plate Porvair® 96/2000 µl	BS-010159-EK
❹ **B-2A**	Block for one deep-well plate Axygen® 96/2200 µl	BS-010159-FK

Other Blocks - please, inquire



CATALOGUE 2015-2016

SHAKER-INCUBATORS, PERSONAL BIOREACTORS

ES-20, Orbital Shaker–Incubator

DESCRIPTION

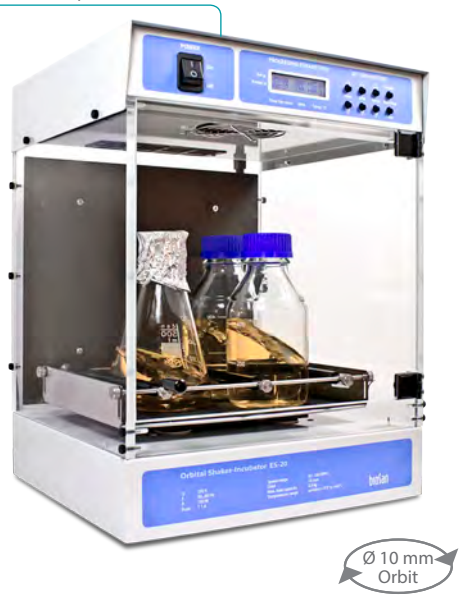
The **ES-20** is a compact bench–top Shaker–Incubator used for mixing of biological liquids as well as for incubation and cultivation of biological liquids according to the operator set program.

Built–in microprocessor thermocontroller provides constant temperature control in the incubator chamber. Forced heated air circulation inside the transparent plexiglas chamber guarantees even temperature distribution. Dismountable construction makes transportation easy.

Orbital shaking is controlled by the digital tachometer (rpm) and Digital time setting regardless of the temperature. The unit is equipped with the direct–drive system ensuring most reliable stable long–time operation (up to 30 day nights).

The **ES-20** is extremely easy to operate, with very straightforward setup of temperature, speed and time, using the two line set–up and status display, which clearly indicates both set and actual values for each of the three parameters.

ES-20 with platform UP-12



Product video is available on the website

SPECIFICATIONS

Temperature setting range	+25°C... + 42°C
Temperature control range	5°C above ambient... + 42°C
Setting resolution	0.1°C/1 rpm
Temperature stability	±0.5°C
Speed control range	50–250 rpm
Orbit	10 mm
Display	LCD, 2×16 signs
Digital time setting	1 min–96 hrs/non–stop (increment 1 min)
Plexiglas walls thickness	7 mm
Load capacity	2.5 kg
Overall dimensions (W×D×H)	340×340×435 mm
Dimensions of the inner chamber	305 × 260 × 250 mm
Weight	13.2 kg
Voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Current/power consumption (230 / 120 V)	160 W (0.7 A)/ 170 W (1.6 A)

HEAT UP TIME FOR **ES-20**

from 25°C — 16 min — to 42°C

Five interchangeable platforms allow using the ES-20 for:

- Growing cell cultures in flasks and other laboratory glassware;
- Extracting tissue samples at physiological temperatures;
- Other sample preparation processes.

ES-20 with platform P-6/250

ORDERING INFORMATION:	Cat. number
ES-20 without platform	BS-010111-AAA

Description and pictures of all platforms can be found on page 14

ES-20/60, Orbital Shaker–Incubator

ES-20/60 with platform P-6/1000

DESCRIPTION

Orbital Shaker–Incubator **ES-20/60** for biotechnological and pharmaceutical laboratories is a professional category equipment designed for cultivation of microorganisms and eukaryotic cells including animal, plant and insect cells. It is also possible to cultivate thermofilic bacteria in **ES-20/60** shaker-incubator.

Shaker is equipped with a direct-drive mechanism for platform motion. It provides reliable and stable operation for the long term experiments needed for cell growth.

Shaker–Incubator **ES-20/60** provides smooth or intensive mixing in flasks installed on the platform.

Built-in noiseless thermoresistant brushless fan provides precise temperature distribution inside the chamber (adjustable for up to +80°C). The inner chamber is made of stainless steel. State–of–the–art motor, newest thermal insulation materials, soft-start of the platform motion and temperature **PID–control** decrease the energy consumption and make the Shaker–Incubator highly energy efficient despite its relatively large size.

SPECIFICATIONS

Speed control range	50–250 rpm (increment 10 rpm)
Temperature setting range	+25°C... +80°C
Temperature control range	10°C above ambient... +80°C
Temperature setting resolution	0.1°C
Temperature stability	±0.5°C
Maximum load	8 kg
Orbit	20 mm
Digital time setting	1 min–96 hrs/non-stop (1 min increment)
Display	LCD, 2×16 signs
Maximum continuous operation time	30 days
Overall dimensions (W×D×H)	590×525×510 mm
Dimensions of the inner chamber	460×350×400 mm
Weight	41.1 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230/120 V)	450 W (2 A)/450 W (4.5 A)

HEAT UP TIME FOR **ES-20/60**

from 25°C — 90 min — to 80°C

ES-20/60 with platform PP-400

ORDERING INFORMATION:	Cat. number
ES-20/60 without platform	BS-010135-AAA
Optional platforms:	
PP-400 with silicone mat	BS-010135-FK
P-30/100	BS-010135-BK
P-16/250	BS-010135-CK
P-9/500	BS-010135-AK
P-6/1000	BS-010135-DK
UP-168 without clamps	BS-010135-JK
Clamp **FC-100**	BS-010126-HK
Clamp **FC-250**	BS-010126-JK
Clamp **FC-500**	BS-010126-LK
Clamp **FC-1000**	BS-010126-IK

Description and pictures of all platforms can be found on page 15

RTS-1 and RTS-1C, Personal bioreactors

Product video is available on the website

Innovative Mixing Technology: Reverse–Spin®

RTS-1 and **RTS-1C** are personal bioreactors which provide "Reverse-Spin" type of agitation and logging of microbial growth in 50 ml tubes in real time.

See the Reverse–Spin® Technology — Innovative Principle of Microbial Cultivation on page 110

SPECIFICATIONS

Measurement range 0–10 OD_{850} at 10–20ml volume (0–24 OD_{600}) 0–8 OD_{850} at 20–30ml volume (0–19 OD_{600})	
Measurement Wavelength (λ)	850 nm
Measurement Precision	±0.3 OD_{850}
Light source	NIR Light diode
Measurement periodicity per hour	1–60
Cultural media volume	10–30 ml
Type of tube for aerobic and anaerobic cultivation: 50 ml tube with membrane filter (TubeSpin® Bioreactor 50, TPP®)*	
Temperature setting range for **RTS-1** (heating only)	+25°C ... +70°C 5°C above ambient ... +70°C
Temperature setting range for **RTS-1C** (with cooling)	+4°C ... +70°C 15°C below ambient ... +70°C
Stability	±0.1°C
Speed control range	50–2,000 rpm
Max. number of units connected to the software	12 (recommended)
Display	LCD
Minimum PC requirements	Intel/AMD Processor, 1 GB RAM, Windows XP**/Vista/7/8/8.1, 2.0 USB port
Optimal PC requirements	Intel/AMD Processor, 3 GB RAM, Windows XP**/Vista/7/8/8.1, 2.0 USB port
Overall dimensions (W×D×H)	130×212×200 mm
Weight	1.5 kg
Input current/power consumption	12 V DC, 3.3 A / 40 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V

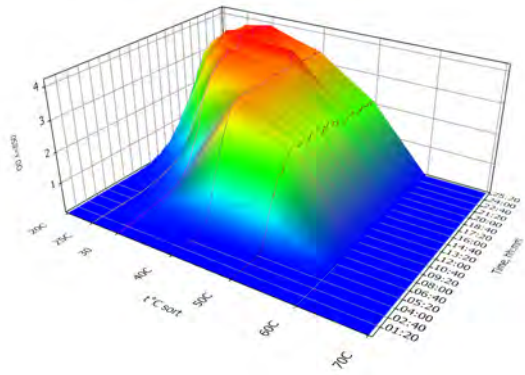
FEATURES

- Innovative mixing due to reverse spinning of the sample around its own axis
- Due to innovative mixing technology it is possible to measure optical density of the probe in real time
- Software has been developed to store, display and analyse the data in real time
- **RTS-1** and **RTS-1C** are compact devices with low profile and small footprint for personal application
- Temperature control allows to use **RTS-1** and **RTS-1C** as an incubator, e.g. for cell growth
- **RTS-1C** has a function of active cooling and temperature profiling via software
- The ability to change parameters such as temperature, RPM and "Reverse-Spin" frequency, allows to achieve consistency and reproducibility of results
- Programmable Cycling/profiling of cultivation parameters such as temperature, RPM, "Reverse-Spin" frequency
- The ability to remotely monitor the process of cultivation while home or using a mobile phone

* — it is also possible to use other manufacturer tubes of the same type, e.g. Corning® 50ml Mini Bioreactor, but the device rotor must be modified. It is possible to request this specific modification.
**— not guaranteed because OS not supported by producer

RTS-1 and RTS-1C, Personal bioreactors

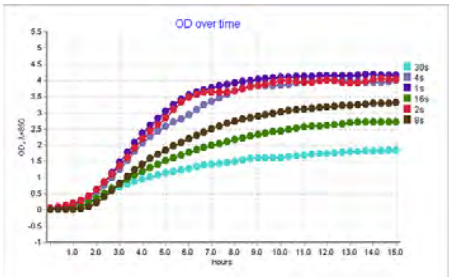
The dependence of the growth kinetics of E. coli BL21 at different temperatures in the 3D format. The experiment was conducted on 7 RTS-1C in parallel.



SOFTWARE FEATURES:

- Real–Time cell growth logging
- 3D graphical representation of OD or growth rate over time over unit
- Pause option
- Save/Load option
- Report option: PDF and Excel
- Connect up to 12 units simultaneously
- Remote monitoring option (requires internet connection)
- Cycling/Profiling options
- User manual calibration options for any microorganism

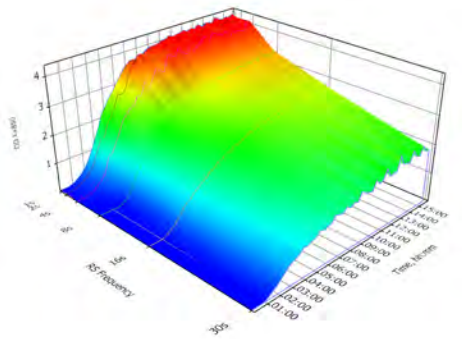
Growth Kinetics and Growth Rate graphs of E. coli BL21



TYPICAL APPLICATIONS:

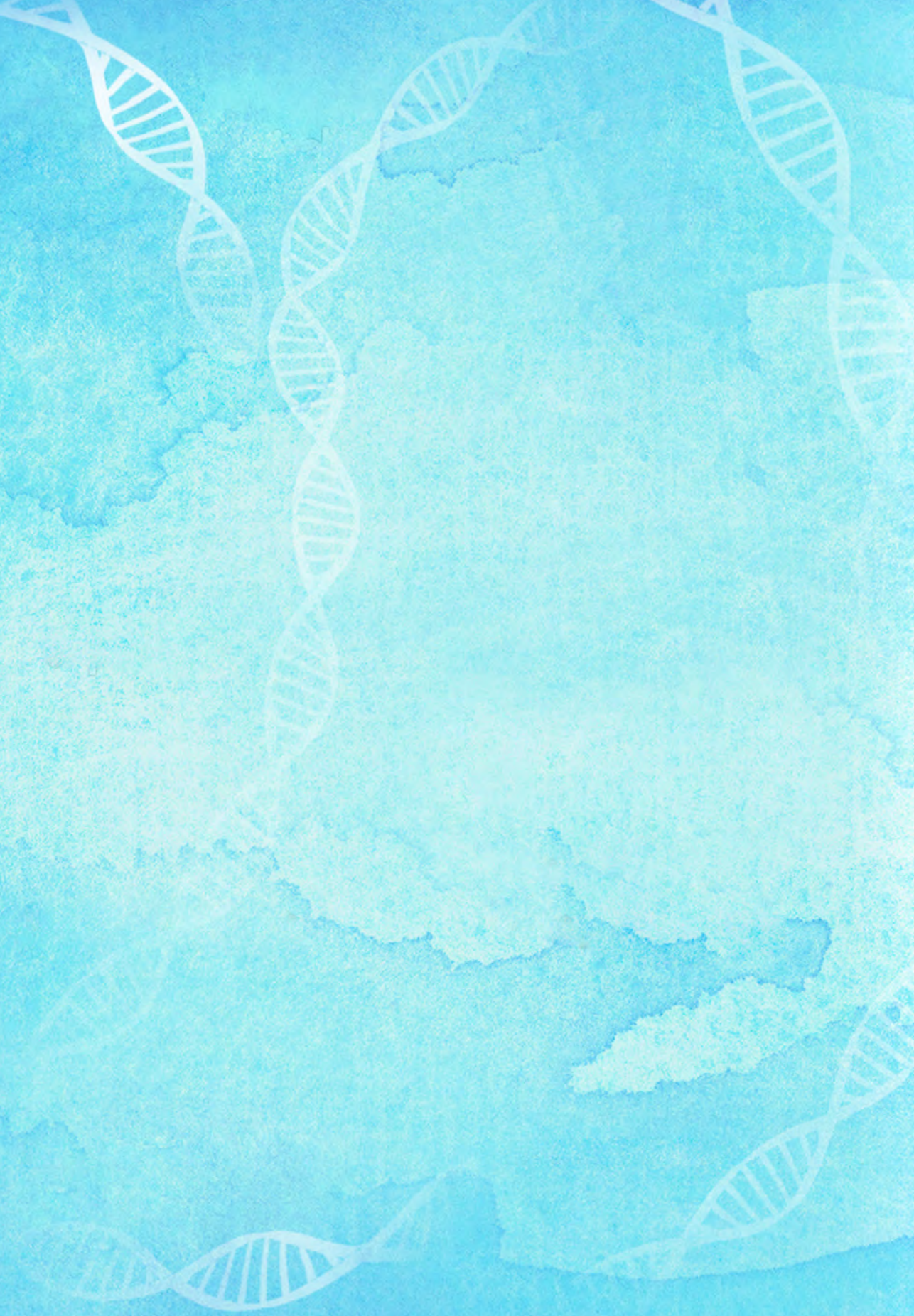
- Bacterial cultivation with real time growth kinetics
- Strain screening
- Temperature stress and fluctuation experiments
- Media screening and optimization
- Synthetic and systems biology
- Inhibition and toxicity tests
- Strain quality control

Growth Kinetics graph of E. coli BL21 in 3D



ORDERING INFORMATION:

	Cat. number
RTS-1C including TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010160-A04
RTS-1 including TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010158-A04
Optional accessories:	
TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010158-AK
USB 2.0 Hub 10 × ports	BS-010158-BK



CATALOGUE 2015-2016

MINICENTRIFUGES-VORTEXES, MINI-CENTRIFUGE, CENTRIFUGES

FV-2400, Microspin

DESCRIPTION

Mini-centrifuge/vortex Micro–Spin **FV-2400** is specially designed for genetic engineering research (for PCR–diagnostics experiments). Units can be used in microbiological, biochemical, clinical laboratories and industrial biotechnological laboratories.

Micro–Spin provides simultaneous mixing and separation of samples, using centrifuge and mixing modules, located on the common spin–module.

FV-2400 is an "open type" centrifuge (without lid), that increases the speed of centrifugation and resuspension operations.

SPECIFICATIONS

Rotation speed (fixed)	2,800 rpm	3,500 rpm
Max. RCF	450×*g*	700×*g*
Continuous and impulse operation modes		
Overall dimensions (W×D×H)	120×170×120 mm	
Weight	1.4 kg	
Nominal operating voltage	120 or 230 V; 50 Hz	120 or 230 V; 60 Hz
Power consumption (120 / 230 V)	30 W (0.27 A) / 30 W (0.13 A)	30 W (0.27 A) / 25 W (0.1 A)

ORDERING INFORMATION:

	Cat. number
FV-2400 white with standard rotor **R-1.5M** and **R-0.5/0.2M**	BS-010201-AAA

Optional rotors: see table below

Optional rotors:		Capacity	Type	Cat. Number
❶ **R-0.5/0.2M**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010201-BK
❷ **R-1.5M**	12×1.5 ml microtubes	12	Standard	BS-010201-AK
❸ **R-2/0.5**	8×2.0 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
❹ **R-2/0.5/0.2**	6×2.0 ml. 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
❺ **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
❻ **SR-64***	Eight 8-section strips for 0.2 ml microtubes	64	Optional	BS-010201-EK

* for any type of strips including paired

❶ R-0.5/0.2M

❷ R-1.5M

❸ R-2/0.5

❹ R-2/0.5/0.2

❺ SR-16

❻ SR-64

Tube vortexing on FV-2400

FVL-2400N, Combi–Spin

Product video is available on the website

DESCRIPTION

Mini-centrifuge/vortex Combi–Spin **FVL-2400N** is specially designed for genetic engineering research (for PCR–diagnostics experiments). Units can be used in microbiological, biochemical, clinical laboratories and industrial biotechnological laboratories.

Combi–Spin provides simultaneous mixing and separation of samples, using centrifuge and mixing modules, located on the common spin–module.

FVL-2400N is provided with protection mechanism that stops the rotor motion when the lid is opened.

SPECIFICATIONS

Rotation speed (fixed)	2,800 rpm	3,500 rpm
Max. RCF	450×*g*	700×*g*
Continuous and impulse operation modes		
Safety	Stop at open lid	
Overall dimensions (W×D×H)	190×235×125 mm	
Weight	1.7 kg	
Nominal operating voltage	120 or 230 V; 50 Hz	120 or 230 V; 60 Hz
Power consumption (120 / 230 V)	30 W (0.27 A) / 30 W (0.13 A)	30 W (0.27 A) / 25 W (0.1 A)

ORDERING INFORMATION: Cat. number

FVL-2400N with standard rotors **R-1.5** and **R-0.5/0.2**	BS-010202-AAA

Optional rotors: see table below

Optional rotors:		Capacity	Type	Cat. Number
❶ **R-0.5/0.2**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010205-BK
❷ **R-1.5**	12×1.5 ml microtubes	12	Standard	BS-010205-AK
❸ **R-2/0.5**	8×2.0 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
❹ **R-2/0.5/0.2**	6×2.0 ml. 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
❺ **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
❻ **SR-32***	Four 8-section strips for 0.2 ml microtubes	32	Optional	BS-010205-FK

* not compatible with Combi-Spins produced before 2015

❶ R-0.5/0.2

❷ R-1.5

❸ R-2/0.5

❹ R-2/0.5/0.2

❺ SR-16

❻ SR-32

MSC-3000 and MSC-6000, Multi–Spins

DESCRIPTION

Centrifuge/vortex Multi–Spins **MSC-3000** and **MSC-6000** are products of many years evolution of Spin–Mix–Spin technology that is intended for collecting micro volumes of reagents on the microtube's bottom (first centrifugation spin), following mixing (mix) and collecting the reagents again from the walls and cap of the microtube (second spin). We named this repetitive algorithm of operation that is aimed at reducing the mistakes during sample preparation for PCR analysis a "sms–algorithm".

Multi–Spin is a fully automatic device for reproducing sms–algorithm for 12 tubes at one time, thus saving time considerably. A must-have instrument for PCR and DNA analyses laboratory. Multi Spin is four devices combined in one:

1. Centrifuge — Maximum RCF:
   MSC-3000: up to 800×*g*
   MSC-6000: up to 2,350×*g*
2. Vortex (3 mixing modes — **soft, medium, hard**; regulated time; Vortexing regulation timer 1–20 sec)
3. Centrifuge/Vortex;
4. SMS–cycler for realization of the "sms–algorithm".

MSC-6000

MSC-3000

Both product video is available on the website

SAVING TIME WITH MULTI-SPIN Multi–Spin allows considerable time saving compared to Combi–Spin by automatically performing cycling program of sample mixing and spinning according to the set spin–mix–spin cycle for 12 microtubes simultaneously.			
	FVL-2400N	**MSC-3000**	**MSC-6000**
Speed control range max.	2,800 rpm	3,500 rpm	6,000 rpm
RCF max.	700×*g*	800×*g*	2,350×*g*
Number of tubes vortexing	1 individually	12 simultaneously	
Time for completing "spin–mix–spin" cycle:			
for 2 microtubes	60 sec	25 sec	15 sec
for 12 microtubes	5–6 min	90 sec	60 sec
for 100 microtubes	60 min	15 min	10 min
Unit price ratio	1×	1.5×	1.6×

MSC-3000 and MSC-6000, Multi–Spins

SPECIFICATIONS

Specifications	MSC-3000	MSC-6000
Speed regulation range (increment 100 rpm)	1,000–3,500 rpm	1,000–6,000 rpm
RCF max.	800×*g*	2,350×*g*
Spin timer	1 sec–99 min	1 sec–30 min
Vortexing intensity	Soft, medium, hard	
Vortexing time	0–20 sec (increment 1 sec)	
SMS–cycle regulation	1–999 cycles	
Display	LCD, 2×16 signs	
Safety	Autostop at open lid	Lid lock
Overall dimensions (W×D×H)	190×235×125 mm	
Weight	2.1 kg	2.5 kg
Input current/power consumption	12 V, 11 W (0.9 A)	24 V, 24 W (1 A)
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V	Input AC 100–240 V 50/60 Hz, Output DC 24 V

Rotor R-1.5

ORDERING INFORMATION: Cat. number

MSC-3000 with standard rotors **R-1.5, R-0.5/0.2**	BS-010205-AAN
MSC-6000 with standard rotors **R-1.5, R-0.5/0.2**	BS-010211-AAL

Optional rotors: see table below

Optional rotors:		Capacity	Type	Cat. Number
❶ **R-0.5/0.2**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010205-BK
❷ **R-1.5**	12×1.5 ml microtubes	12	Standard	BS-010205-AK
❸ **R-2/0.5**	8×2.0 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
❹ **R-2/0.5/0.2**	6×2.0 ml. 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
❺ **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
❻ **SR-32***	Four 8-section strips for 0.2 ml microtubes	32	Optional	BS-010205-FK

*not compatible with Multi-Spins produced before 2015

❶ R-0.5/0.2

❷ R-1.5

❸ R-2/0.5

❹ R-2/0.5/0.2

❺ SR-16

❻ SR-32

CVP-2, Centrifuge vortex for PCR plates

DESCRIPTION

After many years of Combined Centrifuge/Vortex concept success, we are proud to introduce the long awaited Centrifuge/Vortex for PCR plates, **CVP-2**, to the sample preparation market.

The Spin–Mix–Spin technology is intended to spin-down micro volumes of reagents on the well's bottom (first centrifugation spin), following mixing (mix) and spin-down the reagents again from the walls and cap of the well (second spin). We named this repetitive algorithm of operation that is aimed at reducing the mistakes during sample preparation for PCR analysis a "sms–algorithm". This algorithm is registered by BioSan.

CVP-2 is a fully automatic device for reproducing sms–algorithm for 2 PCR plates at the same time, thus saving time considerably. A must-have instrument for PCR and DNA analyses laboratory.

CVP-2 is 4 devices combined in 1:

1. Centrifuge — Maximum RCF: 245 × g (1,500 rpm)
2. Vortex (300–1,200 rpm; Vortexing regulation timer 0–60 sec)
3. Centrifuge/Vortex
4. SMS–cycler for realization of the "sms–algorithm"

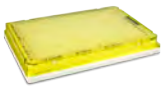
Product video is available on the website

NEW PRODUCT

Adapters **AP-96** for 96-well semi-skirted and non-skirted PCR plates

NEW ADAPTER

Adapter **AP-384** for 384-well PCR plates



SPECIFICATIONS

Speed regulation range	300–1,500 rpm
Max. RCF	245 × g
Vortex regulation range	300–1,200 rpm
Setting resolution	100 rpm
Plate type:	
• Without adapter:	96-well skirted PCR plates, PCR strips in a frame;
• With adapter AP-96:	96-well semi-skirted and non-skirted PCR plates;
• With adapter AP-384:	384-well PCR plates;
Display	LCD, 64 × 128 pixels
Centrifugation mode time range	0 - 30 min
Centrifugation mode time increment	1 s; after 1 min - 1 min
Vortex mode time range	0–60 sec
Number of programmable cycles	1-999
Chamber diameter	210 mm
Overall dimensions (W × D × H)	285 × 350 × 190 mm
Weight	6.15 kg
Input current/power consumption	24V, 750 mA/18 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 24 V

ORDERING INFORMATION: Cat. number

CVP-2 BS-010219-A02

with rotor for two PCR plates, protection lid and adapters AP-96* (a set of 2 adapters for 96-well semi-skirted and non-skirted PCR plates)

Optional accessories:

AP-384* BS-010219-EK2

(A set of 2 adapters for 384-well PCR plates)

* — Adapters are made of Ertacetal® C. Autoclavable

High-speed Mini-centrifuge **Microspin 12**

Product video is available on the website

Protection lid

NEW FUNCTION

Built-in rotor MSR-12 with protective lid, that allows to work not only with microtubes, but also with spin-columns.

❶ A-02 Adapters

❷ A-05 Adapters

DESCRIPTION

High-speed mini-centrifuge **Microspin 12** is a compact desktop centrifuge designed for biomedical laboratories.

Microspin 12 is used for extracting RNA/DNA samples, sedimentation of biological components, biochemical and chemical analysis of microsamples.

A display simultaneously shows actual and set values for:

1. Centrifugation time;
2. Set and actual speed values;
3. Relative centrifugal force.

A brushless rotor provides noiseless performance at the maximal speed and long service life. An angular rotor is designed for accommodation of 12 Eppendorf microtubes and spin columns. The rotor is made of aluminium, it is equipped with fixing lid and included in the standard specification of the centrifuge. Constant airflow around the rotor reduces risk of samples overheating during operation.

Metal protective inserts inside the casing and lid, automatic imbalance switch-off and locking of a lid provide safe operation. Completion of centrifugation is indicated by a sound signal.

The external power supply unit allows operation of **Microspin 12** in cold rooms (at ambient temperatures from +4°C to +25°C).

SPECIFICATIONS

Speed control range	1000 –14,500 rpm (100 rpm increment)
Relative centrifugal force control range	50–12,400 × g
Digital time setting	15s – 30 min
Time setting resolution	1 min - 15s; after 1 min - 1 min
Acceleration time up to 14,500 rpm	20 sec
Slowdown time, not more	10 sec
Display	LCD, 2 line
Safety: Rotor imbalance diagnostics: automatic stop, "IMBALANCE" warning	
Overall dimensions (W × D × H)	200 × 240 × 125 mm
Weight	3.5 kg
Input current/power consumption	24 V, 2.5 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 24 V

ORDERING INFORMATION:	Cat. number
Microspin 12	BS-010213-AA1
Built-in rotor MSR-12 (12 places for microtubes 1.5/2 ml) with protection lid MSL-SC and adapters A-02, A-05	
Additional/replacement parts:	
MSL-SC, protection lid for rotors	BS-010213-EK
❶ **A-02,** 12 pieces for microtubes 0.2 ml	BS-010213-AK
❷ **A-05,** 12 pieces for microtubes 0.5 ml	BS-010213-BK

LMC-3000, Laboratory Centrifuge

DESCRIPTION

LMC-3000 is a modern low-speed bench-top centrifuge designed for operation with microtest plates and centrifuge tubes up to 50 ml. This device is widely used in biomedical profile laboratories.

FEATURES:

- Soft start and run-down of the rotor;
- User-friendly setting of centrifugation parameters (speed and time) and simultaneous display of both set and actual values;
- Safe operation at any speed is provided by metal protection chamber and case cover, automatic stop at imbalance and a lock keeping the lid closed while the centrifuge is running;
- Low noise level;
- Possibility to switch off forced braking; NEW FUNCTION
- Wide choice of accessory rotors (see page 50).

SPECIFICATIONS

Speed regulation range	100–3,000 rpm for centrifuge tubes (1,700 × g)
Speed regulation range	100–2,000 rpm for microtitre plates (560 × g)
Setting resolution	100 rpm
Rotor imbalance diagnostics (automatic stop, "IMBALANCE" warning)	
Display	LCD, 2 × 16 signs
Digital time setting	1–90 min (increment 1 min)
Chamber diameter	335 mm
Overall dimensions (W × D × H)	495 × 410 × 235 mm
Weight	11.8 kg
Nominal operating voltage 230 V, 50/60 Hz or 120 V, 50/60 Hz	
Power consumption (230 / 120 V)	110 W (0.5 A) / 120 W (1 A)

ORDERING INFORMATION:	Cat. number
LMC-3000 without rotors	BS-010208-AAA

Product video is available on the website

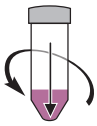
Rotor R-12/15

Rotor R-24GC

Rotors description, pictures and catalogue numbers can be found on page 50

LMC-4200R, Laboratory Refrigerated Centrifuge

Product video is available on the website



DESCRIPTION

Laboratory bench-top centrifuge with refrigeration **LMC-4200R** provides temperature control of biomaterial during centrifugation. Temperature control of the so-called "cold-shelf" is a gold standard for enzymologists and cell biologists because it ensures conditions necessary for reproducibility of the sample preparation stage. Temperature control absence at this stage can cause unpredictable results.

LMC-4200R is a modern centrifuge designed for operation with microtest plates and tubes from 10 to 50 ml.

FEATURES:

- Effective way of acceleration and deceleration:
  Run-up time 20 sec;
  Run-down time, not more 30 sec;
- Efficient rate of chamber refrigeration: under 10 min;
- Maintenance of stable temperature during operation;
- User-friendly setting of centrifugation parameters (speed, temperature, time) and simultaneous display of both set and actual values;
- Safe operation is provided by a metal protection chamber and a case cover, automatic stop at imbalance (emergency shutdown, "IMBALANCE" displayed) and a lock keeping the lid closed while the centrifuge is running;
- Low noise level;
- Possibility to switch off forced braking.
- Wide choice of accessory rotors (see page 50).

NEW FUNCTION

Rotor R-12/10 and icy layer on the chamber walls

SPECIFICATIONS

Temperature control range	–10°C ... +25°C
Stable temperature maintenance range	25°C below ambient ... to +25°C
Temperature setting resolution	1°C
Speed regulation range	100–4,200 rpm for centrifuge tubes (3,370 × g)
Speed regulation range	100–2,000 rpm for microtitre plates (560 × g)
Speed setting resolution	100 rpm
Rotor imbalance diagnostics (automatic stop, "IMBALANCE" warning)	
Slowdown time, not more	30 sec
Display	LCD, 2 lines
Digital time setting	1–90 min (increment 1 min)
Chamber diameter	335 mm
Dimensions	635 × 580 × 335 mm
Weight	56 kg
Nominal operating voltage	230 V, 50 Hz
Power consumption (230 V)	990 W (4.3 A)

Rotors description, pictures and catalogue numbers can be found on page 50

ORDERING INFORMATION:	Cat. number
LMC-4200R without rotors	BS-010212-AAA

Interchangeable Rotors and Accessories for LMC-3000 and LMC-4200R

R-2, SWING-OUT ROTOR FOR STANDARD 96-WELL MICROTITRE PLATES

Rotor type		Swing-out
Dimensions (w × l)		128 × 85.6 mm
Max. height		up to 45 mm
Capacity		2
Max. speed		2,000 rpm
Max. RCF:	**LMC-3000**	560 × *g*
	LMC-4200R	560 × *g*
Plate Manufacturers:		Nunc, Greiner, Sarstedt, Corning, Greiner Bio-one, etc.

Rack for rotors **RR-U**

ORDERING INFORMATION		Cat. number
R-2 rotor		BS-010208-AK
Additional adapter * for R-2:		
AP-96, 2 adapters for 96-well semi-skirted and non-skirted PCR plates		BS-010219-DK

NEW ADAPTER

* Set of 2 adapters, made of **Ertacetal® C.** Autoclavable

R-12/10, SWING-OUT ROTOR FOR ROUND BOTTOM CENTRIFUGE TUBE

Rotor type		Swing-out
Dimensions (Ø × length)		16 × 105 mm
Capacity		12
Tube's volume		10–15 ml
Max. speed		4,200 rpm
Max. RCF:	**LMC-3000**	1,700 × *g*
	LMC-4200R	3,370 × *g*
Tube Manufacturers:		**Nunc, Greiner, Greiner Bio-one, etc.**

Rack for rotors **RR-U**

ORDERING INFORMATION			Cat. number
R-12/10	Swing-out rotor for round bottom centrifuge tube		BS-010208-BK
Additional adapters* for R-12/10:		Dimensions (Ø × length)	
BN-13/75	for vacutainers® 2–5 ml	13 × 75 mm	BS-010208-PK
BN-13/100	for vacutainers® 4–8 ml	13 × 100 mm	BS-010208-QK
BN-16/100	for vacutainers® 8–9 ml	16 × 100 mm	BS-010208-RK

* Set of 12 adapters, made of POM-C (polyacetal). Max temperature +100°C

R-12/15, SWING-OUT ROTOR FOR CONICAL BOTTOM CENTRIFUGE TUBE

Rotor type		Swing-out
Dimensions (Ø × length)		17 × 120 mm
Capacity		12
Tube volume		15 ml
Max. speed		4,200 rpm
Max. RCF:	**LMC-3000**	1,700 × *g*
	LMC-4200R	3,370 × *g*
Tube Manufacturers:		Falcon, Greiner bio-one, Sarstedt, Corning, Nunc, etc.

Rack for rotors **RR-U**

ORDERING INFORMATION		Cat. number
R-12/15	Swing-out rotor for conical bottom centrifuge tube	BS-010208-EK

Interchangeable Rotors and Accessories for LMC-3000 and LMC-4200R

R-6 & **R-6P,** ROTORS FOR PLASTIC TUBES WITH CONICAL BOTTOM AND A LID

R-6

Rack for rotors **RR-U**

	Rotor R-6	Rotor R-6P
Tube holders material	Aluminium	POM Kocetal
Rotor type	Swing-out	
Dimensions (Ø×length)	29×115 mm	
Capacity	6	
Tube volume	50 ml	
Max. speed	4200 rpm	
Max. temperature	-	150 °C
Max. RCF:	**LMC-3000** 1,700×g **LMC-4200R** 3,370×g	
Tube Manufacturers:	Falcon, Greiner Bio-one, Sarstedt, Corning, Nunc, etc.	

R-6P

Rack for rotors **RR-U**

ORDERING INFORMATION		Cat. number
R-6	rotors for plastic tubes with conical bottom and a lid	BS-010208-DK
R-6P		BS-010208-XK

RR-U, RACK FOR ROTORS

ORDERING INFORMATION		Cat. number
RR-U	Rack for rotors	BS-010208-UK

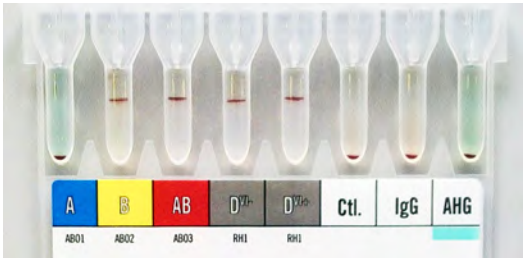
R-24GC, ROTOR FOR GEL CARDS

R-24GC, Rotor for Gel Cards for blood group serology testing (Forward Group, Reverse Group, RhD Type and 3 cell antibody screen)

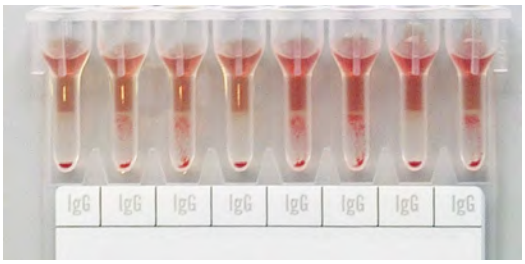
Maximum speed	1,500 rpm
Centrifugation Time	9 minutes
Capacity	24 Gel Cards
Dimensions of a gel card (l ×w)	53 × 74 mm
Gel card Manufacturers:	Grifols®, DiaMed®, etc.
Rotor type	Swing-out

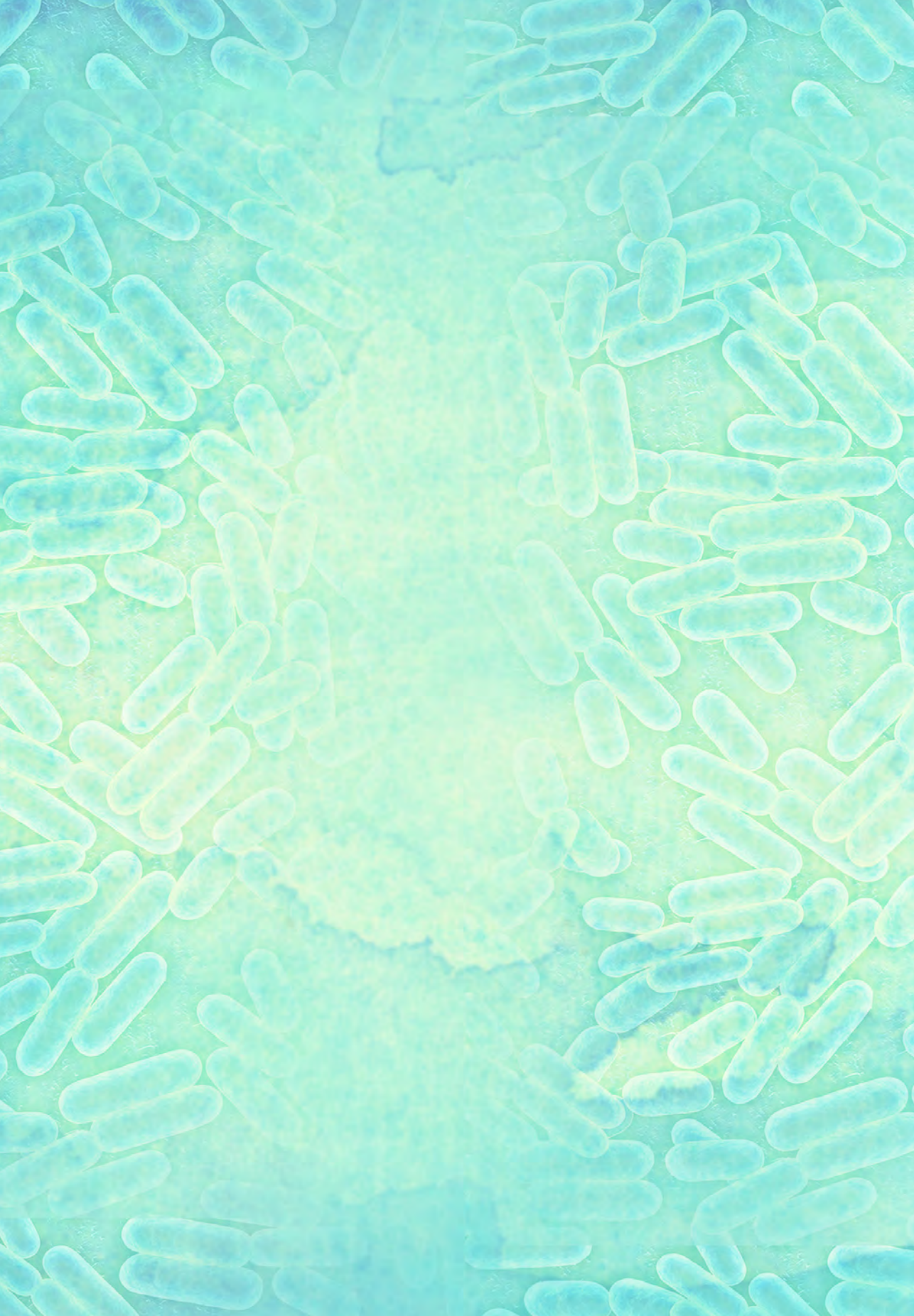
ORDERING INFORMATION		Cat. number
R-24GC	Rotor for Gel Cards	BS-010208-VK

Results after 1,500 rpm spin for 9 minutes using Grifols® Lateral Gel Cards



Results after 1,500 rpm spin for 9 minutes using Grifols® Lateral Gel Cards





CATALOGUE 2015-2016

THERMOSTATED EQUIPMENT: THERMOSTATS – DRY BLOCK, HEATING/COOLING SYSTEMS

Bio TDB-100, Dry Block Thermostat

DESCRIPTION

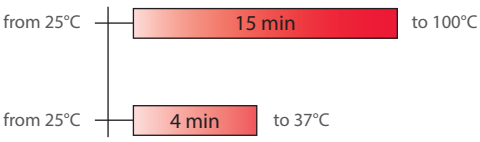
Bio TDB-100 is a compact easy–to–use dry block thermostat designed for long incubation processes at various temperatures. The universal aluminium block can accommodate 3 most popular microtest tubes' types.

Simultaneous indication of set and actual temperature and time.

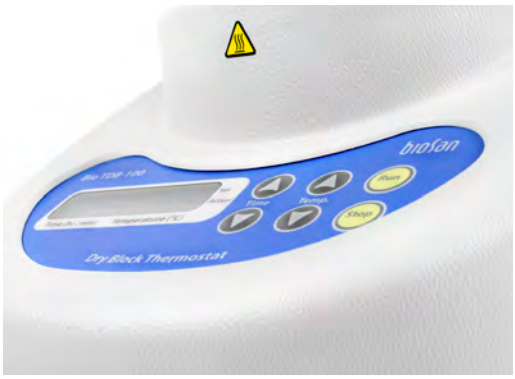
SPECIFICATIONS

Temperature setting range	+25°C ... +100°C
Temperature control range	5°C above ambient ... +100°C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37°C	±0.1°C
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Display	LCD, 2×16 signs
Block diameter / depth	Ø 130 mm / 45 mm
Block capacity: 24×2/1.5 ml + 15×0.5 ml + 10×0.2 ml microtubes	
Overall dimensions (W×D×H)	210×230×115 mm
Weight	2.8 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 V)	200 W (870 mA)

HEAT UP TIMES FOR **BIO TDB-100**



ORDERING INFORMATION:	Cat. number
Bio TDB-100 with built-in block	BS-010412-AAA



TDB-120, Dry Block Thermostat

TDB-120 with block A-103

TDB-120 is a traditional Biosan's dry block thermostat for laboratory analysis. Thermostat is designed for maintaining constant temperature of samples in tubes inserted in the aluminium block sockets. Unprecedented high precision and uniformity of temperature over the block. **TDB-120** is widely used for PCR–analysis.

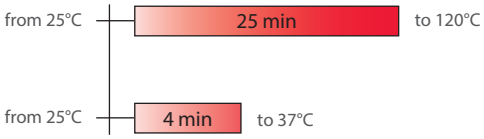
Microprocessor controlled temperature and time. Simultaneous indication of set and actual temperature and time.

DESCRIPTION

SPECIFICATIONS

Temperature setting range	+25°C ... +120°C
Temperature control range	5°C above ambient ... +120°C
Temperature setting resolution	0.1°C
Temperature stability @ +37°C	±0.1°C
Temperature uniformity @ +37°C	±0.1°C
Display	LCD, 2×16 signs
Digital time setting	1 min–96 hrs (increment 1 min)
Overall dimensions (W×D×H)	230×210×110 mm
Weight	2.8 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 V)	200 W (870 mA)

HEAT UP TIMES FOR **TDB-120**



BLOCKS (BUILT IN) SPECIFICATIONS:

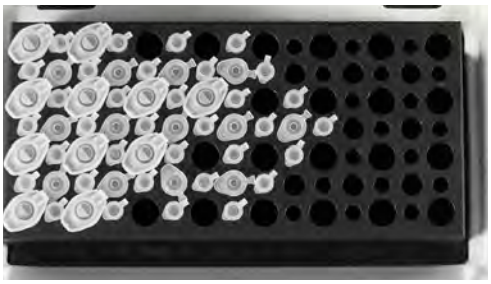
Two models are available offering a choice of tube configurations to meet the needs of many standard laboratory procedures:

❶	**Block A-103**	21×0.5 ml + 32×1.5 ml + 50×0.2 ml microtubes
❷	**Block A-53**	21×0.5 ml + 32×1.5 ml microtubes

ORDERING INFORMATION:

	Cat. number
TDB-120 with block **A-103**	BS-010401-QAA
TDB-120 with block **A-53**	BS-010401-PAA

❶ Block A-103



❷ Block A-53

CH-100, Heating/Cooling Dry Block

DESCRIPTION

CH-100 is the result of combining two popular Biosan instruments:

1. Heating Dry block and
2. Cooling Dry block thermostat

The combined construction of aluminium block and Peltier element module cooled with the forced ventilation radiator provides fast changing of the cooling and heating modes.

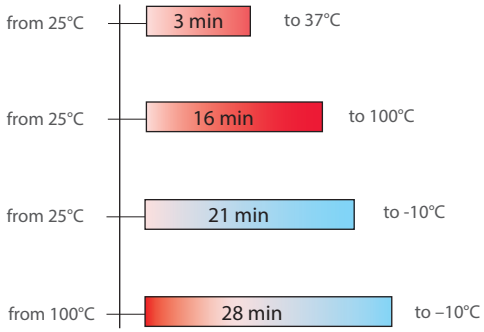
CH-100 is a very effective instrument of sample preparation during enzyme reactions, hybridization reactions, DNA analysis.

Microprocessor controlled time and temperature. Simultaneous indication of set and actual temperature and time.

SPECIFICATIONS

Temperature setting range	–10°C ... +100°C
Temperature control range	30°C below ambient ...+100°C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37°C	±0.1°C
Digital time setting	1 min – 96 hrs / non–stop (increment 1 min)
Display	LCD, 2×16 signs
Overall dimensions (W×D×H)	240×260×165 mm
Weight	3.2 kg
Input current/power consumption	12 V, 4.4 A / 55 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

HEAT UP AND COOL DOWN TIMES FOR **CH-100**



BLOCKS* CAPACITY:

Block **CH-1**	20×0.5 ml + 12×1.5 ml microtubes
Block **CH-2**	20×1.5 ml microtubes
Block **CH-3**	20×2 ml microtubes

* — the blocks are built-in

ORDERING INFORMATION:

	Cat. number
CH-100 with block CH-1	BS-010410-BAI
CH-100 with block CH-2	BS-010410-CAI
CH-100 with block CH-3	BS-010410-UAI

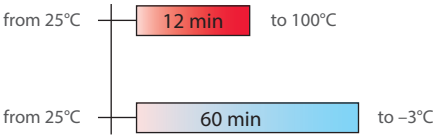
Ice on block CH-2

CH3-150, Combitherm-2

Combitherm-2 **CH3-150** is specially designed to thermostabilise materials at temperatures from –3°C to +150°C according to methods of analysis. To obtain useful functionality and decrease foot-print of instruments Combitherm-2 thermoblocks combined in a common electronic circuit board as well as inside a common external body. The left part of the front keyboard is responsible for setting parameters for cooling plug-in blocks and the right part — for heating plug-in blocks. Both of them are regulated independently and can realize up to 16 programs including temperature and time in each program. Peltier technology is used for cooling below room temperature; PCB is used for heating till +150°C.

Separation of cooling and heating parts from each other increases durability of the instrument and speed of temperature changing after setting a new program.

HEAT UP AND COOL DOWN TIMES FOR **CH3-150**



INTERCHANGEABLE THERMOBLOCKS:

1	B2-50	Ø48 mm x 2 sockets depth 58 mm
2	B10-16	**Ø16 mm x 10 sockets depth 56 mm**
3	B6-25	Ø25 mm x 6 sockets depth 40 mm
4	B23-1.5	23 sockets for 1.5 ml microtest tubes depth 35 mm
5	B10-13	Ø13 mm x 10 sockets, flat bottom, depth 30 mm
6	B5-29	Ø29 mm x 5 sockets, flat bottom, depth 40 mm
7	B18-12	18 sockets for 12x75 mm round bottom tubes

Different block types can be provided on request

ORDERING INFORMATION:	Cat. number
CH 3-150 without blocks	BS-010418-AAA
Optional blocks	
B2-50	BS-010418-AK
B10-16	BS-010418-BK
B6-25	BS-010418-CK
B23-1.5	BS-010418-DK

SPECIFICATIONS

Heating Block Specifications:	
Temperature setting range	+25°C ... +150°C
Temperature control range	5°C above ambient ...+150°C
Setting resolution	1°C
Stability	±0.1°C

Cooling Block Specifications:	
Temperature setting range	–3°C ... +20°C
Temperature control range	23°C below ambient ... 5°C below ambient
Setting resolution	0.1°C
Stability	±0.1°C

General Specifications	
Digital timer with sound alarm	1 min–99 hrs 59 min (increment 1 min)
User adjustable programs (temperature and time)	16 (heating) +16 (cooling)
Display	LCD
Overall dimensions (W×D×H)	295×285×220 mm
Weight, not more	5,6 kg
Heating power	500 W
Nominal operating voltage	230 V, 50/60 Hz
Power consumption	420 W (1.8 A)

1 B2-50 2 B10-16 3 B6-25 4 B23-1.5 5 B10-13 6 B5-29 7 B18-12

QB Series, Dry Block Heating Systems with Interchangeable Blocks

Equipment presented on pages 58-59 is produced by Grant Instruments (Cambridge) Ltd. Biosan is a sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and an official distributor for a number of other regions.

DESCRIPTION

A market leading range of versatile, high quality dry block heating systems with excellent temperature control, providing a source of precision heating for many sensitive analytical procedures.

A premium product range at an affordable price:

- Accurate, reproducible and safe heating of your samples — advanced temperature control combined with high quality, precision-engineered blocks providing excellent thermal contact;
- Versatile range of interchangeable heating blocks to fit any tube or plate you are using for your samples;
- Full range of models and options to cater for basic through to more sophisticated applications;
- Wide range of accessories.

Product video is available on the website

QBD4 with a lid

QBH2

Accessories

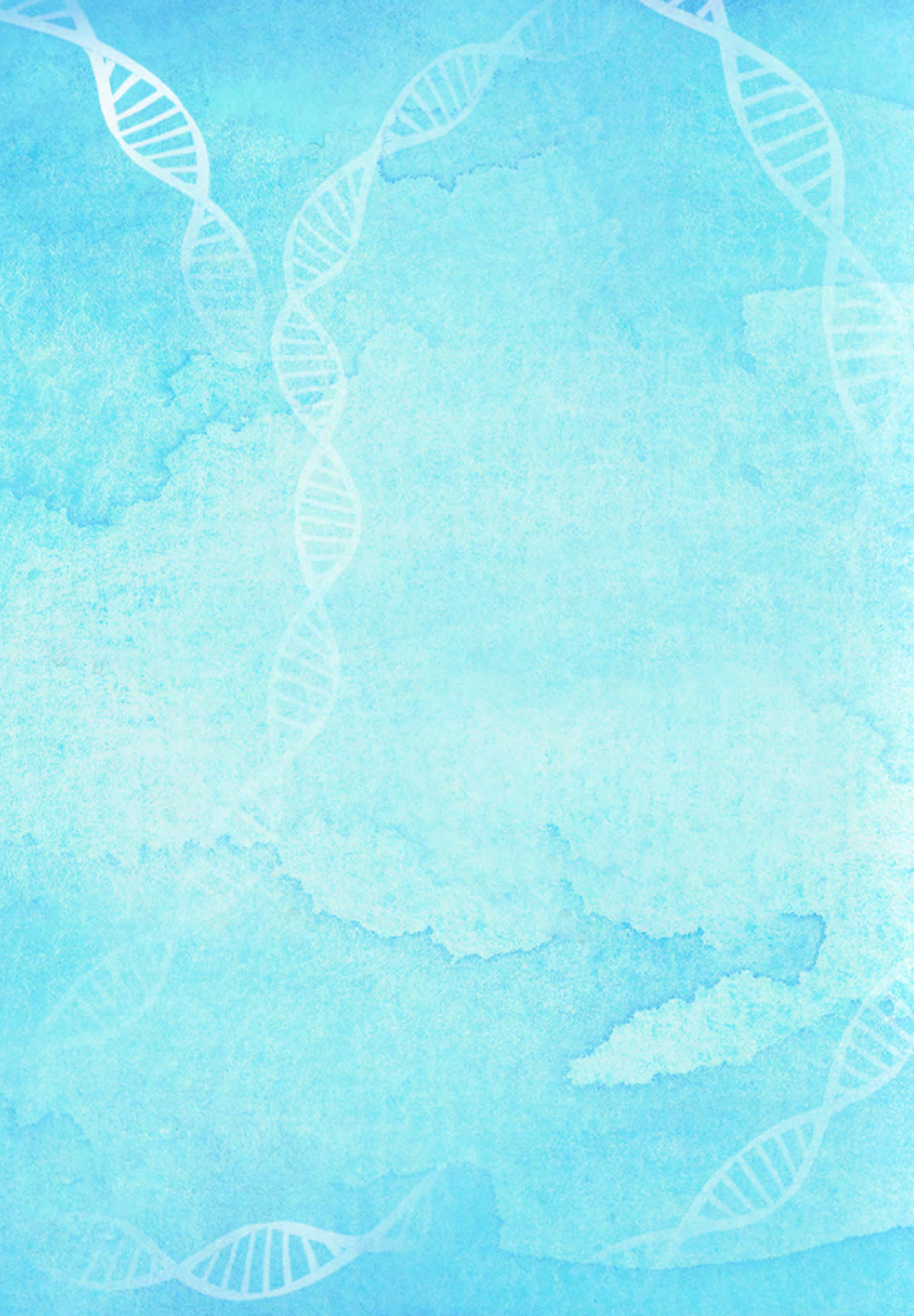
SPECIFICATIONS

Model (Cat. Num.)	QBD1 / QBD2 / QBD4	QBH2	QBA1 / QBA2
Type	Digital	Digital	Analogue
Number of blocks	1 / 2 / 4	2	1 / 2
Temperature range	amb. +5°C to 130°C	amb. +5°C to 200°C	amb. +5°C to 100°C
Temperature setting range	+15°C to 130°C	+15°C to 200°C	15°C to 100°C
Temperature stability @ 37°C	±0.1	±0.1	±1
Temperature uniformity within the block @ 37°C	±0.1	±0.1	±1
Display / Resolution	LED / 0.1°C	LED / 0.1°C	n/a
Safety: Overtemperature	Thermal fuse		
Timer with a sound alarm	1 min up to 72 hrs		n/a
Heat up time from 25°C to 100°C	15 min		25 min
Power consumption	150 / 300 / 600 W	300 W	150 / 300 W
Power supply	115 V or 230 V		

All available accessories can be found on page 59

QB Series, Dry Block Heating Systems with Interchangeable Blocks: Accessories

Interchangeable blocks (Cat. Num.)		QBD1	QBD2	QBD4	QBH2	QBA1	QBA2
No. of blocks		1	2	4	2	1	2
QB-0 Plain block without holes		+	+	+	+	+	+
QB-10 24 × 10 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-12 24 × 12 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-13 12 × 13 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-16 12 × 16 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-17H for 10 × Falcon tubes tall 17 mm diam, 75 mm deep		+	+	+	+	+	+
QB-18 12 × 18 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-24 5 × 24 mm Ø holes and universal bottles, 50 mm hole depth		+	+	+	+	+	+
QB-50 4 × 50 ml centrifuge tubes, glass universals, 50 mm hole depth		+	+	+	+	+	+
QB-H 56 × 0.2 ml microtube, 14 mm hole depth		+	+	+	+	+	+
QB-E0 24 × 0.5 ml microtube, 30 mm hole depth		+	+	+	+	+	+
QB-E1 24 × 1.5 ml microtube, 35 mm hole depth		+	+	+	+	+	+
QB-E2 24 × 2.0 ml microtube, 14 mm hole depth		+	+	+	+	+	+
QB-DN Dolphin nose tube 24 × Ø 11.13 mm to Ø 6.1 mm		+	+	+	+	+	+
External Pt1000 temperature probe							
QBEP	Standard probe. For in-sample or in-block temperature control;encased in stainless steel sheath, Ø 3 mm × 30 mm long, with 350 mm of cable	+	+	+	+	–	–
QBEP-WM	Short-form probe. For in-sample or in-block temperature control; encased in stainless steel sheath, Ø 3 mm × 14 mm long, with 350 mm of cable	+	+	+	+	–	–
Microplate blocks of molecular biology and biotechnology applications Double-size blocks 140 × 100 × 75 mm supplied with additional extraction tool							
QDP-H	96 holes in microplate configuration for 0.2 ml microplates, strips or individual tubes Uniformity ± 0.3°C within tubes across the block; 6.2 mm Ø holes, 14 mm hole depth	–	+	–	+	–	+
QDP-FL	Universal block for standard 96-well plates (u-well, v-well, flatm bottom, high temperature) Uniformity ± 0.5°C between wells; supplied with hinged, double layer lid to create an insulated incubation chamber	–	+	–	+	–	+
Safety covers (not required with QDP-FL Microtiter blocks)							
	Made from tough clear acrylic for maximum visibility whilst preventing accidental touching of a hot block or contamination of samples from splashes. Clearance height 85 mm	QBL1	QBL2	QBL4	QBL2	QBL1	QBL2



CATALOGUE 2015-2016

THERMOSTATIC EQUIPMENT: WATER BATHS, ORBITAL/LINEAR SHAKING BATHS, UNSTIRRED WATER BATHS, HEATING/COOLING CIRCULATORS

WB-4MS, Stirred water bath

DESCRIPTION

Water bath-thermostat **WB-4MS** is designed for chemical, pharmaceutical, medical and biological laboratory research.

WB-4MS provides increased temperature stabilization (up to 0.1°C) due to built-in magnetic stirrer (regulated speed 250–1,000 rpm).

Easy set up, high temperature maintenance accuracy, compact size and attractive modern design make this water bath widely used.

SPECIFICATIONS

Tank capacity	4 litres
Temperature setting range	+25°C ... +100°C
Temperature control range	5°C above ambient ... +100°C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37°C	±0.1°C
Stirring speed control range	250–1,000 rpm
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Display	LCD, 2×16 signs
Digital setting of temperature, time and mixing speed	
Plastic lid with stainless steel interior included	
Quiet operation	
Working volume	235×135×110 mm
Overall dimensions (W×D×H)	340×270×250 mm
Weight	3.4 kg
Nominal operating voltage 230 V, 50/60 Hz or 120 V, 50/60 Hz	
Power consumption	230 V, 50 Hz / 600 W (2.6 A) 120 V, 60 Hz / 670 W (5.6 A) 100 V, 50/60 Hz / 600 W (6.0 A)

WB-4MS with base **BP-1** (on the bottom)

Base **BP-1**

6 Rack QR-LE

4 Rack QR-30

2 Rack QR-19

ORDERING INFORMATION:

	Cat. number
WB-4MS with base **BP-1** and **lid**	BS-010406-AAA

Optional racks:

QR racks	Tube size	Capacity	Cat. number
1 QR-13	ø 10-13 mm	30	QR-13
2 QR-19	ø 16-19 mm	16	QR-19
3 QR-24	ø 24 mm	10	QR-24
4 QR-30	ø 30 mm	5	QR-30
5 QR-SE	0.5 ml	44	QR-SE
6 QR-LE	1.5 ml	35	QR-LE

Combined Orbital/Linear Shaking Bath OLS26

NEW PRODUCT

DESCRIPTION

Patented, combined orbital and linear shaking mechanism of the OLS26 allows optimisation of aeration and shear forces mixing, for reproducible results

- Precision digital temperature control
- 0°C to 99°C operating range
- Stability ±0.1°C
- Easy changeover from linear to orbital shaking
- Adjustable shaking speed and stroke length
- Polycarbonate lid included as standard
- Drain tap for convenient emptying
- 3 year warranty
- For flexibility, tray sold seperately

Equipment presented on pages 63-74 is produced by Grant Instruments (Cambridge) Ltd. Biosan is a sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and an official distributor for a number of other regions.

SPECIFICATIONS

Tank size	26L
Minimum working depth	70 mm
Temperature range	ambient +5 to 99°C. 0 to 99°C with accessory cooling
Uniformity (DIN 12876-3) @ 70°C	±0.1°C
Stability (DIN 12876-3) @ 70°C	±0.1°C
Display	2 x LED (individual displays and controls for temperature and shaking speed)
Orbital and Linear shaking speed	20 to 200 rpm (depending on load)
Orbital shaking radius	9 mm
Shaking speed display resolution	1 rpm
Linear shaking stroke length	18, 28, and 36 mm
Shaking tray area	380 x 235 mm
Timer	1 to 999 mins
Heater power 120V / 230V	1.05 / 1.4 kW
Drain tap	yes
Safety	over temperature protection / low liquid level cut-out
Supply voltage	110-120V or 220-230V

ORDERING INFORMATION:	Cat. number
OLS26	OLS26

Description and pictures of all available accessories can be found on page 65

Linear shaking bath — LSB Aqua Pro range

DESCRIPTION

World-renowned shaking water baths. High quality, robust design with unique magnetically coupled shaking mechanism for maximum reliability, consistency and quiet operation. Extensive range of accessories to provide the right solution for your application. Varied vessels types can be securely held using high quality, springs, clamps or racks.

FEATURES:

- Ambient +5˚C to 99˚C operation
- Stability ±0.1˚C
- Choice of two models – 12 and 18 litre
- Drain tap for convenient emptying
- 3 year warranty
- Polycarbonate lid included
- Extensive choice of accessory shaking trays. Tray sold seperately

NEW PRODUCT

SPECIFICATIONS

	Linear shaking bath	
	LSB12	**LSB18**
	9.2 kg h: 275 mm d: 360 mm w: 335 mm	11.2 kg h: 275 mm d: 565 mm w: 335 mm
Tank size	12L	18L
Minimum working depth	60 mm	
Temperature range	ambient +5 to 99°C	
Uniformity (DIN 12876-3) @ 70°C	±0.1°C	
Stability (DIN 12876-3) @ 70°C	±0.1°C	
Display	LED	
Linear shaking speed	20 to 200 rpm (depending on load)	
Shaking speed display resolution	1 rpm	
Linear shaking stroke length	20 mm	
Shaking tray area	240 x 235 mm	420 x 235 mm
Timer	1 to 999 mins	
Heater power 120 / 230V	0.8/0.8 kW	1.05/1.4 kW
Drain tap	yes	
Safety	over-temperature protection / low liquid cut-out	
Supply voltage	110-120V or 220-230V	

ORDERING INFORMATION: Cat. number

LSB12, Linear shaking bath 12 L — LSB12
LSB18, Linear shaking bath 18 L — LSB18

Description and pictures of all available accessories can be found on page 65

Accessories for Shaking Baths: LSB 12, LSB 18 & OLS 26

Accessories **LSB** and **OLS Aqua Pro** Product / description		**OLS26**	**LSB12**	**LSB18**
	Universal tray - with adjustable springs. Highly versatile for a variety of vessel types.	TU26	TU12	TU18
	Flask / plate tray - with threaded holes to accept flask clamps or holder for deep well plates (≥2ml). See options below.	TF26	TF12	TF18
	Test tube tray - compatible with SR racks or can be used alone to accommodate bags and miscellaneous vessels. See rack options below.	TS26 (holds up to 5 SR racks)	TS12 (holds up to 3 SR racks)	TS18 (holds up to 5 SR racks)
	Base tray - perforated stainless steel, allows bath to be used as an unstirred bath.	SBT26	SBT12	SBT26
	Cooling coil - source of constant cooling to enable bath to be operated at or below ambient, down to 0oC. LS200 lid (with access hole for cooling coil) recommended.	CC26	-	
	Heat exchange coil - attach to a cold water supply or refrigerated circulator. Can be used down to 2oC above the temperature of the coolant. LS200 lid (with access hole for cooling coil) recommended.	CW26	-	
	Stainless steel lid, gabled.	LS200	LU14	LU28
	Replacement polycarbonate lid, clear, gabled.	AQL26	AQL12	AQL26

ORDERING INFORMATION: catalogue number matches the name of the product

Unstirred Water Bath

SUB Aqua Pro - advanced water bath range with a choice of 8 models. Supplied with base tray, lid and drain on larger bath.

JB Academy - basic range with a choice of 3 models. Supplied with base tray.

JB Nova - general purpose water bath range with a choice of 4 models. Supplied with base tray, lid and drain on larger bath.

SBB Aqua Plus boilingbath range - basic range with a choice of 3 models. Supplied with base tray.

The reliability, quality and consistent performance of Grant products have made Grant a leading manufacturer of water baths for decades.

- A new era for Grant water baths – now all models from basic to advanced with digital controls
- Proven performance – technology to deliver temperature control you can rely on
- Set and Forget™ technology - minimal bath setup, maximum time for your work

More information about offered Grant Instruments products can be found on Biosan web-site www.biosan.lv

SUB Aqua Pro Digital Unstirred Water Bath

In Russia, CIS and Baltic countries (Latvia, Lithuania, Estonia) this type of water bath will be available under Biosan-Grant WB-Plus label*

Built to the highest standard and specifications and incorporating the latest technology the SUB Aqua Pro advanced water bath range supports even the most demanding applications requiring accurate temperature control. Choose from eight models with base tray and lid included as standard.

- Ambient +5°C to 99°C operation
- Set and Forget™ technology - fast heat–up, accurate temperature control
- Stability ±0.2°
- Adjustable over temperature alarm - protect samples from over heating
- Advanced dry start and run dry protection
- Three programmable temperature presets
- 3 year warranty

DESCRIPTION

SPECIFICATIONS

SUB Aqua Pro digital unstirred water bath range – summary of specifications								
	SAP2S	**SAP2**	**SAP5**	**SAP12**	**SAP18**	**SAP26**	**SAP34**	**SAPD**
	***WB2S PLUS**	***WB2 PLUS**	***WB5 PLUS**	***WB12 PLUS**	***WB18 PLUS**	***WB26 PLUS**	***WB34 PLUS**	***WBDUAL PLUS**
	3 kg l: 200 mm w: 185 mm h: 200 mm	3 kg l: 215 mm w: 335 mm h: 150 mm	3 kg l: 215 mm w: 335 mm h: 200 mm	6 kg l: 380 mm w: 360 mm h: 225 mm	9.5 kg l: 590mm w: 335 mm h: 275 mm	9 kg l: 590 mm w: 335 mm h: 275 mm	14.5 kg l: 770 mm w: 335 mm h: 370 mm	9 kg l: 380 mm w: 545 mm h: 225 mm
Tank capacity	2 L	2 L (shallow)	5 L	12 L	18 L	26 L	34 L	5L & 12L
Temperature range	ambient t°C + 5 to 99							
Temp. display and setting resolution	0.1°C							
Temp stability (DIN 12876) @ 70°C	±0.2°C							
Temperature setting/energy regulation	digital							
User adjustable over temp. alarm	+							
Fixed thermal cut-out	+							
Dry start/boil dry protection	+							
Programmable temp. presets	3							
Countdown timer with audible alarm	1 to 999 mins							
Working volume l/w mm	117 × 131	139 × 289	131 × 281	281 ×306	485 × 281	481 × 278	635 × 281	131/281 or 281/306
Drain tap included	-	-	-	+	+	+	+	+
Heater power 120V/ 230V kW	0.25/0.25	0.35/0.35	0.35/0.35	0.8/0.8	1.4/1.05	1.4/1.05	1.8/1.3	1.15/1.15
Supply voltage V	120 or 230							
	CE and CSA approved							

ORDERING INFORMATION: catalogue number matches the name of the product

SUB Aqua Pro Digital Unstirred Water Bath

SPECIFICATIONS

OPTIONS AND ACCESSORIES							
SAP2	**SAP2S**	**SAP5**	**SAP12**	**SAP18**	**SAP26**	**SAP34**	**SAPD**
2 L	2 L	5 L	12 L	18 L	26 L	36 L	5 L & 12 L
Replacement polycarbonate transparent lids*							
AQL2	AQL5	AQL5	AQL12	AQL26	AQL26	–	AQL5, AQL12
Directs condensation away from immersed vessels, avoids contamination, reduces evaporation and saves energy							
Stainless steel sloping lids*							
–	LU6	LU6	LU14	LU28	LU28	LU36	LU6 & LU14
Flat lids*							
–	–	LF6 (2 ring sets	LF14 (4 ring sets)	LF28 (6 ring sets)	LF28 (6 ring sets)	LF36 (8 ring sets	LF6 / LF14
With ring sets of variable hole diameter to accommodate tall vessels whilst reducing evaporation							
Polypropylene spheres* (packs per bath)							
1 × PS20	1 × PS20	1 × PS20	1 × PS20	2 × PS20	2 × PS20	3 × PS20	2 × PS20
Useful alternative to a lid, minimises evaporation and heat loss whilst allowing easy access to vessels in the bath; particularly useful for tall vessels							
Raised shelves – reversible, allows two shelf depths. h = shelf height above tank base (mm)							
–	–	–	RS14H (h 40 or 78) shelf covers half area of SAP12	RS18H (h 40 or 135) shelf covers half area of SAP18	RS28H (h 45 or 135) shelf covers half area of SAP26	RS36H (h 45 or 135) shelf covers half area of SAP34	RS14H (h 40 or 78) shelf covers half area of SAPD
Racks (no. per bath)							
		1 × J2	2 × J2	4 × J2	4 × J2	6 × J2	1 + 2 × J2
Choice of 8 variants to accommodate different tube diameters and microtubes (see below)							
Replacement base trays							
AQBT2	AQBT5	AQBT5	AQBT12	AQBT26	AQBT26	SBT36	AQBT5 & AQBT12
Required if flat-bottomed flasks are to be placed directly on the base of the bath and to promote thermal convection in the bath							

*lid or spheres recommended for use above 60˚C

Unstirred Bath Racks					
J2 Racks	**Tube size Ø**	**Capacity**	**J2 Racks**	**Tube size Ø**	**Capacity**
J2-10	10 mm	84	J2-25	25 mm	18
J2-13	13 mm	55	J2-30	30 mm	12
J2-16	16 mm	36	J2-SE	0,5 ml	105
J2-19	19 mm	32	J2-LE	1,5 ml	65

ORDERING INFORMATION: catalogue number matches the name of the device

Optima™ Series, Stirred Thermostatic Baths and Heating Circulators

DESCRIPTION

A cost-effective range of multi-purpose systems combining Grant's legendary quality and reliability. Precise temperature control for a wide range of laboratory applications.

- Accurate and safe temperature control — for samples and users
- Intuitive programming and thoughtful design features — makes working with Grant stirred baths and circulators easy
- Robust, durable construction — for longevity, reliability and long-term low cost of ownership
- A complete range — 32 models to cover basic through to sophisticated needs, each model represents excellent value for money

Applications:

Grant stirred baths and circulators provide a source of precision heating and cooling for many routine and sensitive analytical procedures including sample incubation, calibration and quality control testing. All models from the **TC120** upwards are suitable for use as both open and closed loop circulators (i.e. remote vessel open or closed).

For more powerful heating requirements, i.e. above 200°C, contact marketing@biosan.lv for advice.

Model selection (see 71):

Any of the four Grant Optima™ digital thermostats can be combined with any of eight Grant tanks (five stainless steel and three plastic) to provide a choice of 32 models.

Heating Circulators Specifications on page 70 and all available accessories on page 71

Optima™ Series, Heating Circulators Specifications

T100

TC120

TX150

TXF200

SPECIFICATIONS

Grant Optima™ Heating Circulators Specifications		General purpose Digital		Digital High Performance	
		T100	**TC120**	**TX150**	**TXF200**
Stability (DIN 12876) @ 70°C	°C	± 0.05°C	± 0.05	± 0.01	± 0.01
Uniformity (DIN 12876) @ 70°C	°C	± 0.1	± 0.1	± 0.05	± 0.05
Setting resolution	°C	0.1	0.1	0.1 (0.01 with Labwise™)	
Display		4 digit LED		full colour QVGA TFT	
Timer function		–	1 to 6000 mins	1 min to 99 hrs 59 mins	
No. preset temperatures		3	3	3	3
Two point re-calibration		+	+	+	+
Offset adjustment		–	–	+	+
Socket for external probe (TXPEP, TXSEP)		–	–	+	+
Communication interface		–	–	USB & RS232	USB & RS232
Programmable		–	–	remote via PC 1 program/ 30 segments	direct via user interface or remote via PC/laptop 10 programs / 100 segments
Relays		–	–	1	1
Safety	overtemperature	fixed	adjustable cut-out		
Safety	fluid level — float switch	+	+	+	+
Alarms (can be configured to switch a relay)		–	high, without relay	high and low	high and low
Heater power	230 V kW	1.3	1.3	1.9	1.9
Electrical power	230 V kW	1.4 (50–60 Hz)	1.4 (50 Hz)	2.0 (50 Hz)	2.0 (50–60 Hz)
Height above tank rim	mm	200	200	200	200
Depth below tank rim	mm	135	135	135	135
Grant Optima™ thermostat pumps (integral)					
Maximum pressure	water mbar	–	210	310	530
Maximum flow	water L/min	–	16	18	23 (adjusted flow rate)
Pipe bore	inlet/outlet mm	–	6.11	6.11	6.11
Dimensions (H × D × W)	mm	315 × 145 × 115			
ORDERING INFORMATION:					
		T100 EURO	**TC120 EURO**	**TX150 EURO**	**TXF200 EURO**

Optima™ Series, Water Bath Combinations and Accessories

Capacity (L) **Outer tank dimensions**	• Working area (L × W) • Min/max liquid depths • Inner tank dimensions (L × W × H) • Overall dimensions incl. controller (L × W × H)	**T100** Temperature setting range	**TC120** Temperature setting range	**TX150** Temperature setting range	**TXF200** Temperature setting range
ST5 – 5 L **stainless steel-** 3 kg h: 200 mm d: 330 mm w: 180 mm	• 150 × 150 mm • 85/140 mm • 300 × 150 × 150 mm • 330 × 180 × 395 mm	**T100–ST5** amb.+15 to 100°C	**TC120–ST5** 0 to 120°C	**TX150–ST5** 0 to 150°C	**TXF200–ST5** 0 to 200°C
ST12 – 12 L **stainless steel –** 4.5 kg h: 200 mm d: 360 mm w: 330 mm	• 205 × 300 mm • 85/140 mm • 325 × 300 × 150 mm • 360 × 330 × 395 mm	**T100–ST12** 0 to 100°C	**TC120–ST12** 0 to 120°C	**TX150–ST12** 0 to 150°C	**TXF200–ST12** 0 to 200°C
ST18 – 18 L **stainless steel -** 7 kg h: 200 mm d: 540 mm w: 330 mm	• 385 × 300 mm • 75/130 mm • 505 × 300 × 150 mm • 540 × 330 × 395 mm	**T100–ST18** 0 to 100°C	**TC120–ST18** 0 to 120°C	**TX150–ST18** 0 to 150°C	**TXF200–ST18** 0 to 200°C
ST26 – 26 L **stainless steel-** 7.5 kg h: 225 mm w: 330 mm d: 540 mm	• 385 × 300 mm • 125/180 mm • 505 × 300 × 200 mm • 540 × 330 × 405 mm	**T100–ST26** 0 to 100°C	**TC120–ST26** –15 to 120°C	**TX150–ST26** –15 to 150°C	**TXF200–ST26** –15 to 200°C
ST38 – 38 L **stainless steel -** 11 kg h: 225 mm d: 730 mm w: 330 mm	• 575 × 300 mm • 125/180 mm • 690 × 300 × 200 mm • 730 × 333 × 405 mm	**T100–S38** 0 to 100°C	**TC120–S38** –15 to 120°C	**TX150–S38** –15 to 150°C	**TXF200–S38** –15 to 200°C
P5 – 5 L plastic - 2.5 kg h: 180 mm d: 240 mm w: 330 mm	• 120 × 150 mm • 85/140 mm • 240 × 160 × 150 mm • 390 × 200 × 360 mm	**T100–P5** amb.+15 to 99°C	**TC120–P5** amb.+15 to 99°C	**TX150–P5** amb.+15 to 99°C	**TXF200–P5** amb.+15 to 99°C
P12 – 12 L plastic - 3.5 kg h: 180 mm d: 415 mm w: 350 mm	• 210 × 280 mm • 85/140 mm • 325 × 280 × 150 mm • 415 × 350 × 360 mm	**T100–P12** amb.+5 to 99°C	**TC120–P12** amb.+5 to 99°C	**TX150–P12** amb.+5 to 99°C	**TXF200–P12** amb.+5 to 99°C
P18 – 18 L plastic - 5 kg h: 180 mm d: 600 mm w: 365 mm	• 280 × 325 mm • 85/140 mm • 510 × 290 × 150 mm • 600 × 350 × 380 mm	**T100–P18** amb.+5 to 99°C	**TC120–P18** amb.+5 to 99°C	**TX150–P18** amb.+5 to 99°C	**TXF200–P18** amb.+5 to 99°C
OPTIONS AND ACCESSORIES					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture (see p. 16.1 for more information)		–	–	+	+
External probes (optional)					
TXPEP flexible plastic probe, 3 m cable TXSEP stainless steel probe, 3 m cable		– –	– –	+ +	+ +
Remote switching device (optional)					
For switching appliances on and off (up to max. 8 Amps)		–	–	1	2
Vertical turbine pumps (optional)*					
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm					
VTP 1 **VTP 2**	max. pressure 1,000 mbar max. flow 9 L/min max. pressure 1,650 mbar max. flow 12 L/min	+ +	Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		

ORDERING INFORMATION: catalogue number matches the name of the product

Optima™ Series, Water Bath Accessories

ACCESSORIES

	Lids to help reduce evaporation/heat loss and avoid sample contamination	**Polypropylene** spheres (no. of packs required)	**Rack systems*** to optimise use of available bath capacity (no. of racks accommodated)	**Raised shelves** to allow shallow vessels to be accommodated	**Accessory cooling systems** to allow systems to operate at or below room temperature by means of a cooling coil dipped into the bath; designed for minimal impact on working area		
					Refrigerated immersion coolers Consist of a cooling coil connected to a refrigeration unit by a flexible pipe. Extract heat continuously, with the bath control unit controlling temperature		**Heat exchange coil** Designed to be attached to a supply of cooling tap water or a refrigerated circulator
					C1G (0 to 40°)	C2G (–15 to 40°C)	CW5 (2°C above coolant temperature)
ST5 – 5 L stainless steel	**STL5** flat stainless steel	1 x PS20	**1 × QR***	–		–	
ST12 – 12 L stainless steel	**STL12** gabled, hinged (removable) stainless steel	1 x PS20	**2 × VR***	**RS14**		–	
ST18 – 18 L stainless steel	**STL26** gabled, hinged (removable) stainless steel	2 x PS20	**4 × VR***	**RS22**		–	
ST26 – 26 L stainless steel	**STL26** gabled, hinged (removable) stainless steel	2 x PS20	**4 × VR***	**RS28**			
ST38 – 38 L stainless steel	**STL38** gabled, hinged (removable) stainless steel	3 x PS20	**6 × VR***	**RS28 or RS38**			
P5 – 5 L plastic	**PL5** flat, stainless steel	1 x PS20	**1 × QR***	–	–	–	–
P12 – 12 L plastic	**PL12** curved plastic	1 x PS20	**2 × VR***	**RS14**	–	–	–
P18 – 18 L plastic	**PL18** curved plastic	2 x PS20	**4 × VR***	**RS22**	–		–

** — for Rack Systems description see 68*

Optima™ R series, Refrigerated Thermostatic Baths and Circulators

The Grant Optima™ LTC2 Kit includes TC120 heating circulator and R2 tank/refrigeration unit

We recommend the following liquids for use with refrigerated thermostatic baths and circulators:

- –50 to 50°C: Silicone oil — low viscosity (Bayer silicone M3)
- –30 to 30°C: 50% water 50% antifreeze (inhibited ethylene glycol)
- 0 to 30°C: 80% water 20% antifreeze (inhibited ethylene glycol)
- 5 to 99.9°C: Water

Cost-effective and efficient multi-purpose systems for low temperature applications.

- Powerful precision cooling whether used in open-loop or closed-loop format
- Combining legendary quality, reliability and design for everyday usage — useful features, straightforward maintenance, compact design
- Robust, durable construction for longevity, reliability and long-term low cost of ownership
- A complete range — 18 models to cover basic through to sophisticated needs
- All refrigeration products come with market-leading 3-year warranties

Grant low temperature circulators provide a source of precision cooling for many sensitive analytical procedures including spectrophotometry, viscometry, refractometry and electrophoresis. They are suitable for use in both open and closed loop circulation (i.e. remote vessel open or closed).

Alternatively, Grant RC series of recirculating chillers (closed circulators) can be used. These are generally needed for more powerful cooling requirements, e.g. the removal of mechanical or electrical heat produced in apparatus or machinery. Please contact Grant for advice.

Model selection (see page 74):

The four Grant Optima™ thermostats can be combined with the five Grant refrigeration units to provide a choice of 18 models.

Heating Circulators Specifications and all available accessories on page 74

Optima™ R series, Refrigerated Thermostatic Baths: Combinations and Accessories

Capacity (L) Outer tank dimensions	• Working area (L × W) • Min/max liquid depths • Weight	**T100** h: 315 mm d: 145 mm w: 115 mm	**TC120** h: 315 mm d: 145 mm w: 115 mm	**TX150** h: 315 mm d: 145 mm w: 115 mm	**TXF200** h: 315 mm d: 145 mm w: 115 mm
R1 – 5 L stainless steel h: 410 mm d: 410 mm w: 230 mm *Cat.num.: R1*	• 110 × 145 mm • 80/140 mm •20 kg	T100–R1	TC120–R1	TX150–R1	TXF200–R1
R2 – 5 L stainless steel h: 410 mm d: 410 mm w: 230 mm *Cat.num.: R2*	• 110 × 145 mm • 80/140 mm • 20 kg	T100–R2	TC120–R2	TX150–R2	TXF200–R2
R3– 5 L stainless steel h: 410 mm d: 410 mm w: 230 mm *Cat.num.: R3*	• 110 × 145 mm • 80/140 mm • 21 kg	–	–	TX150–R3	TXF200–R3
R4 – 20 L stainless steel h: 530 mm d: 490 mm w: 390 mm *Cat.num.: R4*	• 230 × 305 mm • 80/140 mm • 40 kg	T100–R4	TC120–R4	TX150–R4	TXF200–R4
R5 – 12 L stainless steel h: 585 mm d: 575 mm w: 415 mm *Cat.num.: R5*	• 260 × 115 mm • 120/180 mm • 47 kg	T100–R5	TC120–R5	TX150–R5	TXF200–R5
Options and accessories					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture (see p. 16.1 for more information)		–	–	+	+
External probes (optional)					
TXPEP flexible plastic probe, 3 m cable TXSEP stainless steel probe, 3 m cable		– –	– –	+ +	+ +
Remote switching device (optional)					
For switching appliances on and off (up to max. 8 Amps)		–	–	1	2
Vertical turbine pumps (optional)					
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm			Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		
VTP 1 max. pressure 1,000 mbar; max. flow 9 L/min		+			
VTP 2 max. pressure 1,650 mbar; max. flow 12 L/min		+			

CATALOGUE 2015-2016

MAGNETIC STIRRERS, OVERHEAD STIRRER

MS-3000 and MMS-3000, Magnetic Stirrers

DESCRIPTION

MS-3000 and **MMS-3000** are compact magnetic stirrers with stainless steel working surface. Units provide stirring of liquids with rotation speed of magnetic element up to 3000 rpm. Up to date it is the highest value of the maximal speed for magnetic stirrers of global producers.

Strong magnets hold the driven magnetic element firmly in the magnetic clutch. Stirring is performed without undesirable heating and noise.

Enclosures of stirrer **MS-3000** are made of strong steel and painted with powder enamel, which is chemically resistant to acids and alkali.

The stirrers are supplied with a cylinder-shape magnetic stirring bar (6×25 mm) encapsulated in PTFE for universal use.

MMS-3000 is equipped with a detachable stand for supporting various sensor elements (temperature, pH and others) inside the stirred liquid.

Magnetic stirrers are ideal laboratory instruments for PH-metering, extraction and dialysing with the small quantities of substances.

Operation temperature range +4°C to +40°C (from cold rooms to incubators) at maximal relative humidity 80%.

MS-3000

CATALOGUE NUMBER:	Cat. number
MS-3000	BS-010301-AAF
MS-3000 blue (on request)	BS-010301-ABF
MMS-3000	BS-010305-AAF
Optional accessories for MMS-3000:	
SKM2 (Clamp, see page 79)	BS-010309-AK
DPMD (Double clamp, see page 79)	BS-010309-CK

MS-3000

MMS-3000 with a stand

MS-3000 and MMS-3000, Magnetic Stirrers

SPECIFICATIONS

	MS-3000	MMS-3000
Speed control range	0–3,000 rpm	
Stirring volume up to (H_2O)	5 litres	20 litres
Working surface material	Stainless steel	
SR-1, attachable stand size	—	Ø8×320 mm
Max. length of magnetic stirring element (bar)	50 mm	70 mm
Stirring liquid viscosity	up to 1,170 mPa.s	
Maximum continuous operation time	12 hrs	
Operation in closed laboratory rooms	at ambient temperature from +4°C to +40°C	
Working plate size	110×110 mm	Ø 160 mm
Overall dimensions (W×D×H)	120×150×65 mm	185×230×75 mm
Weight	0.8 kg	1.5 kg
Input current/power consumption	12 V, 220 mA / 2.6 W	12 V, 250 mA / 3 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V	

MMS-3000

MMS-3000

MSH-300 and Intelli-Stirrer MSH-300i, Magnetic Stirrers with hot plate

DESCRIPTION

MSH-300 and **Intelli-Stirrer MSH-300i** are magnetic stirrers of the new generation. Enclosures of stirrers are made of metal painted with powder enamel chemically resistant to acids and alkali. The stirrers are equipped with a detachable stand for supporting various sensor elements (temperature, pH and others) inside the stirred liquid.

The stirrers are supplied with a cylinder-shape magnetic stirring bar (6×25 mm) for universal use covered with Teflon.

Units are equipped with the overheat protection providing an automatic switch-off of the device when overheating for the set temperature difference occurs.

Magnetic stirrers with heating can be used for laboratory operations such as organic synthesis, extraction, analysis of oil products, pH-measurements, dialysis, soil suspending, preparing buffer solutions, etc.

Additional protection disables the heating, if the temperature of plate exceeds the set temperature for 30°C.

Operation temperature range +4°C to +40°C (from cold rooms to incubators) at maximal relative humidity 80%.

CATALOGUE NUMBER:	Cat. number
MSH-300 with stand	BS-010302-OAA
Optional accessories:	
SKM2 (Clamp)	BS-010309-AK
DPMD (Double clamp)	BS-010309-CK

MSH-300 with a stand

Product video is available on the website

DESCRIPTION

Intelli-Stirrer MSH-300i is a digital version of magnetic stirrer with heating; it is designed for laboratories with higher requirements. It offers digital setting and control of temperature and rotation speed.

A powerful magnet allows mixing solutions with glycerine viscosity level. Maximum volume of stirred liquid (water) is 20 litres.

An external probe provides direct control of the stirred liquids temperature.

EXTERNAL TEMPERATURE PROBE*:	
Probe type	Thermocouple
Connection	type K
A cable is covered with Teflon, mechanically strong, elastic and chemically stable against oils, acids, aggressive reagents and liquids	
Cable length	1 m
Operation temperature range	–50°C to +250°C

CATALOGUE NUMBER:	Cat. number
Intelli-Stirrer MSH-300i with stand	BS-010309-AAA
Optional accessories:	
External temperature probe	BS-010309-BK
SKM2 (Clamp)	BS-010309-AK
DPMD (Double clamp)	BS-010309-CK

Intelli-Stirrer **MSH-300i** with a stand and external probe, SKM2, DPMD clamps

MSH-300 and Intelli-Stirrer MSH-300i, Magnetic Stirrers with hot plate

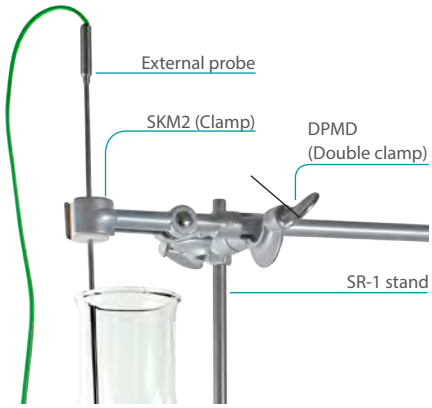
	MSH-300	Intelli-Stirrer MSH-300i
Speed control range	250–1,250 rpm	100–1,250 rpm (10 rpm increment)
Max. stirring volume (H_2O)	15 litres	20 litres
Plate temperature regulation range	+30°C...+330°C	+30°C ... +330°C (1°C increment)
Temperature control range with external probe	—	20°C ... +150°C
Display	—	LCD
Temperature uniformity on the plate	±3°C	
Working plate heating time till 330°C	15 min	11 min
Diameter of working plate	160 mm	
Plate material	Aluminium alloy	
SR-1, attachable stand size	Ø 8×320 mm	
Length of magnetic stirring element	10–50 mm	20–70 mm
Max. stirring liquid viscosity	up to 1,170 mPa.s	
Fault indication	Outputs sound signal and turns off the heating	Outputs an error code on the display, turns off the heating
Overall dimensions (W×D×H)	190×270×100 mm	
Weight	2.9 kg	3.2 kg
Nominal operating voltage	230 V; 50/60 Hz or 120 V; 50/60 Hz	
Power consumption (Stirring)	8.5 W	
Power consumption (Heating)	550 W	

PLATE HEAT UP TIME FOR MSH-300

PLATE HEAT UP TIME FOR INTELLI-STIRRER MSH-300I

Connecting external probe to the Intelli-Stirrer MSH-300i

DPMD (Double clamp) with holder for external probe



MM-1000, Overhead Stirrer Multi Mixer

DESCRIPTION

Overhead Stirrer Multi Mixer **MM-1000** is designed for stirring liquids up to 20 litres. Quiet and reliable mixer that can provide stable continuous mixing up to 7 daynights. It can realize three types of motion: ❶ **Rotational** ❷ **Reciprocal** ❸ **Vibration**.

MM-1000 performs separate (mono–) (1; 2; 3), consecutive binary cycles *(c)* (1–2) × *c*; (1–3) × *c* and (2–3) × *c* and complex tri-cycles (1–2–3) × *c*.

Speed, angle and time of stirrer rotation is under microprocessor control.

Multi-mixer can be used for stirring solutions up to the "medium viscosity" range (from 1,000 to 10,000 mPa.s). It is an ideal instrument for biotechnology, organic synthesis, analytical laboratories.

The innovative combination of three motion types provides high level of homogeneity due to consecutive combination of laminar and turbulent flows that cause substances to dissolve faster.

Electrically safe and energy efficient — powered by 12 V external power supply.

MM-1000 on a stand

SPECIFICATIONS

SPECIFICATIONS OF MOVEMENT TYPES:

❶ **Rotation:**	
Speed regulation range	40–1,000 rpm
Time	0–250 sec
❷ **Reciprocal motion:**	
Turning angle	0°–360° (increment 30°)
Time	0–250 sec
❸ **Vibro motion:**	
Turning angle	0°–5° (increment 1°)
Timer	0–5 sec
Maximal stirring volume (water)	20 l

Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Overall dimensions (W × D × H)	140 × 135 × 250 mm
Weight	2.4 kg
Input current/power consumption	12 V, 700 mA / 8.4 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V

Accessories for MM-1000

CATALOGUE NUMBER:	Cat. number
MM-1000 without stirrers	BS-010306-AAH

Optional accessories:	Type	Dimensions	Cat. number:
A MP-1	Paddle stirrer	378 × (70 × 70) ×8 mm	BS-010306-AK
B MP-2	Propeller stirrer	2 folding blades (326 × 55 × 8 mm)	BS-010306-BK
C MP-3	Propeller stirrer	3 folding blades (325 × 50 × 8 mm)	BS-010306-CK
D MA-1	Anchor stirrer	332 × 90 × 8 mm	BS-010306-DK
E MC-1	Centrifugal stirrer	358 × 60 (110) × 8 mm	BS-010306-EK
F Double clamp	—	For device mounting	VELA00001301
G Rod and base (page 80)	—	For device mounting, 40 × 30 × 87cm	VELA00001300

A MP-1

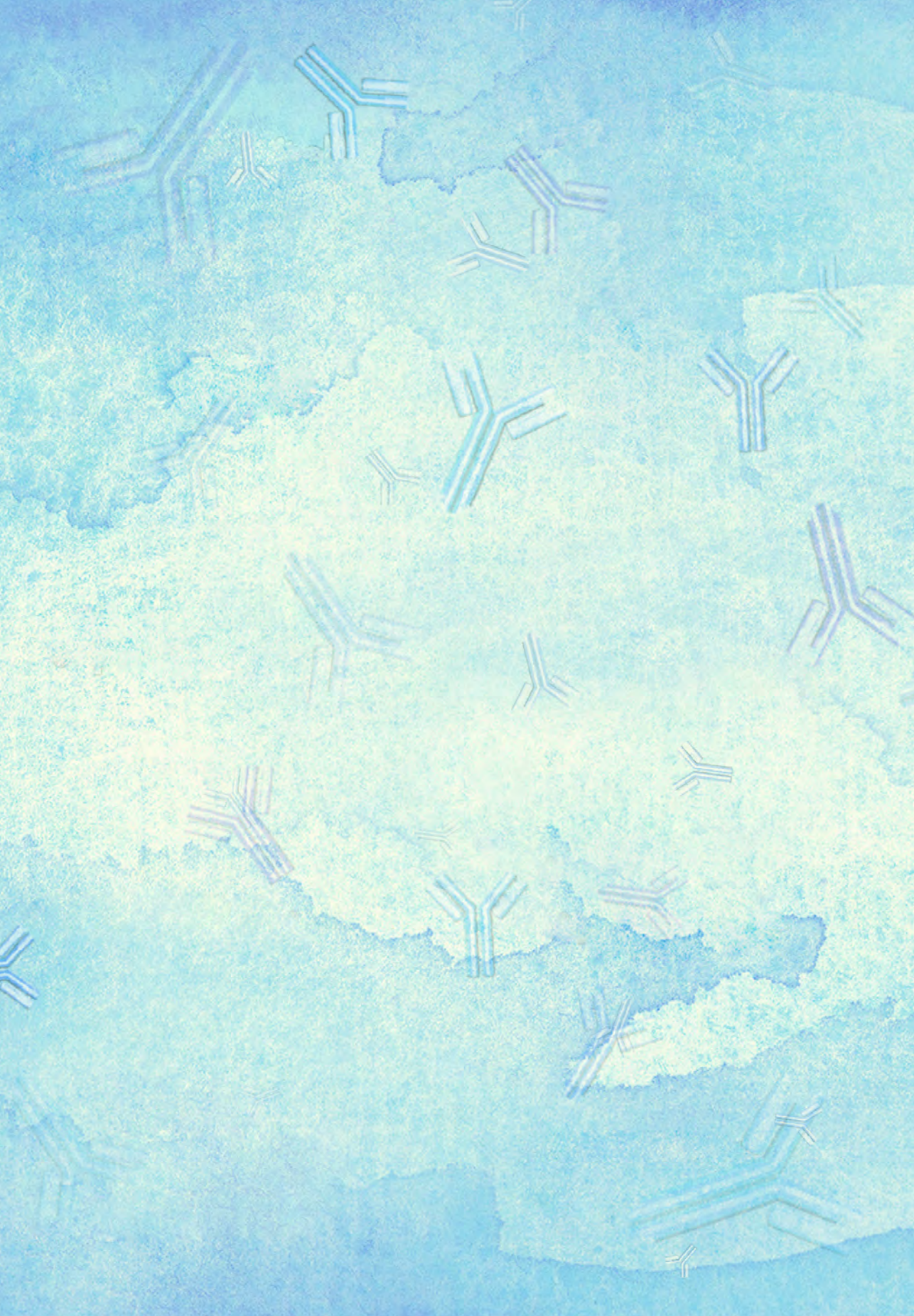
B MP-2

C MP-3

D MA-1

E MC-1

F Double clamp



CATALOGUE 2015-2016

BIOSAFETY EQUIPMENT:
BIOSAFETY AIR
BIOSAFETY WATER

UVR-M and UVR-Mi, UV Cleaner–Recirculators

DESCRIPTION

UVR-M and **UVR-Mi** are applicable for UV air inactivation in research laboratory rooms, waiting rooms in outpatients departments, surgeries and veterinary stations.

The devices provide complete protection from direct ultraviolet radiation.

ADVANTAGES OF UVR-MI:

- UVR-Mi is the more powerful model of UV air flow cleaner with two UV-lamps
- Full user protection from direct UV radiation;
- Two operation modes — short time (under timer control) and continuous operation;
- Indication of UV lamps working hours.

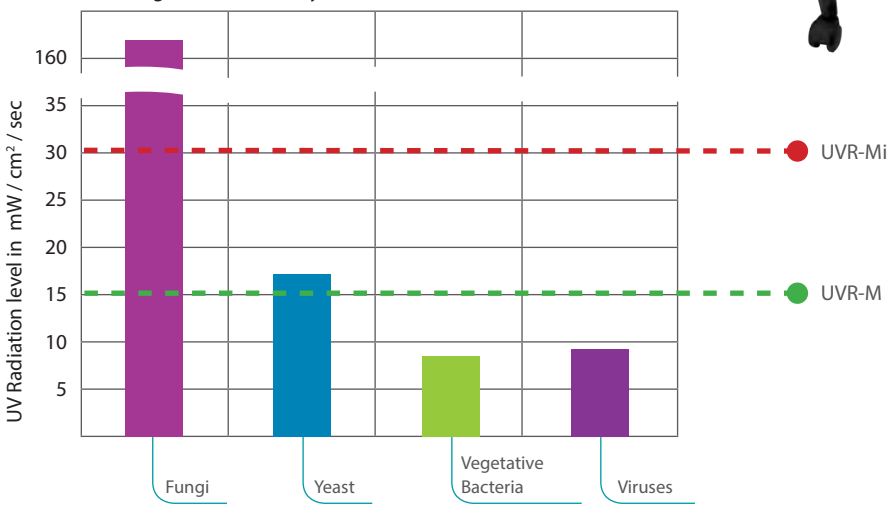
RECIRCULATORS FIXATION:

- Convenient fixation on walls (standard)
- Mounting on a movable tripod (optional) A

UVR-M

UVR-Mi

Microorganisms sensitivity to UV radiation

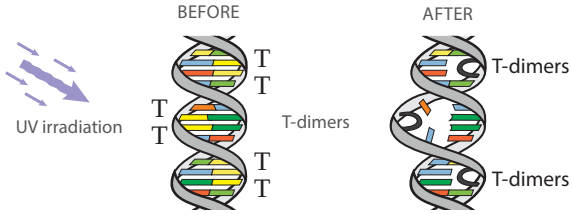


UVR-M and UVR-Mi, UV Cleaner–Recirculators

SPECIFICATIONS

Specifications:	UVR-M	UVR-Mi
UV radiation source: *25W Bactericidal (Philips), TUV25WG13 UV-C*	1 lamp	2 lamps
UV radiation level	18 mW / cm² / sec	36 mW / cm² / sec
Air-flow productivity	14 m³/hour	
Full user protection from direct UV light	Yes	
Display	—	LCD
UV lamp operation indicator	Yes	Yes
UV lamp lifetime counter	No	Yes
Timer	—	1 min–24 hrs / non–stop
Automatic switch ON/OFF	—	Yes
Lamp fault detection	—	Yes
Overall dimensions (W×D×H)	110×135×660 mm	110×130×660 mm
Weight	3.4 kg	3.4 kg
Nominal operating voltage	230 V, 50 Hz or 120 V, 60 Hz	230 V, 50 Hz
Power consumption (230 / 120 V)	125 VA (540 mA) / 160 VA (1.3 A)	110 W (0.5 A)

Operation principle



T — thymine formations

ORDERING INFORMATION: Cat. number

UVR-M	BS-040105-AAA
UVR-Mi	BS-040110-AAA
Optional adapters:	
UVR-S (tripod)	BS-040105-AK

See UVR-M and UVR-Mi, UV-air flow Cleaner–Recirculators Test Report on page 123

BEFORE AFTER

DNA/RNA UV-Cleaner Boxes

DESCRIPTION

DNA/RNA UV-cleaner boxes (**UVC/T-AR, UVC/T-M-AR, UVT-B-AR** and **UVT-S-AR**) are designed for clean operations with DNA samples. They provide protection against contamination.

All models are bench-top type, made of metal framework, glass (or plexiglas) walls and working surface painted with powder enamel or made of stainless steel (See the specifications table on the page 88).

UV-cleaner boxes are equipped with an open UV lamp installed in the upper hood. UV-radiation from the open lamps disinfects the working area inactivating DNA/RNA fragments during 15–30 min of exposure. A digital timer controls duration of the direct UV irradiation. A daylight lamp provides proper illumination of the working surface.

UVC/T-M-AR

UV-cleaner boxes are equipped with a flow-type bactericidal **UV cleaner–recirculator AR**, which provides constant decontamination inside the box during operation. They are recommended for operations with DNA/RNA amplicons.

UV cleaner–recirculator AR consists of a UV lamp, a fan and dust filters organized in a special body so that a user working with a UV-cleaner box is protected against UV light. Recirculator increases the maximum density of UV light making it sufficiently effective for DNA/RNA inactivation. The UV–recirculator processes 100 UV-cleaner box volumes per hour, creating permanent aseptic conditions of operation inside the UV-cleaner box.

UVC/T-AR

Specially assigned mobile tables (with wheel locks) with a drawer are available on request. Two versions:

- **A T-4, for single size UV–Cabinets**
- **B T-4L, for double size UV–Cabinets**

Other optional furniture is featured on page 105.

A UVT-B-AR on the table T-4

ADVANTAGES OF BIOSAN UV-CLEANER BOXES:

- Ozone free high density UV decontamination
- Long living UV lamps (8,000 hours average)
- Automatic switch off of UV-lamps when the protective screen is opened
- Bactericidal flow-type recirculator providing permanent decontamination inside UV-cleaner box during operation
- Shockproof glass walls
- Low noise, low energy consumption
- Tables for installation of UV-cleaner boxes
- UV-cleaner boxes with the bactericidal **UV cleaner–recirculator AR** is the patented Biosan solution

DNA/RNA UV-Cleaner Boxes

B UVT-S-AR on the double size table T-4L

Product video is available on the website

Development and evaluation of DNA amplicon quantification video is available on the website

DNA/RNA UV-cleaner box UVT-S-AR with equipment for nucleic acid extraction

Table T-4L

LF-1, laboratory chest of drawers

Table T-4

See "Development and evaluation of DNA amplicon quantification" on page 115

See "Laboratory Furniture" on page 105

ORDERING INFORMATION:	Cat. number
UVC/T-AR with inlet	BS-040102-AAA
UVT-B-AR with internal socket	BS-040109-AAA
UVT-B-AR with inlet	BS-040109-A05
UVC/T-M-AR with inlet	BS-040104-AAA
UVC/T-M-AR with internal socket	BS-040104-A06
UVT-S-AR with internal sockets	BS-040107-AAA
Laboratory Furniture:	
T-4, table	BS-040101-BK
T-4L, table	BS-040107-BK
T-4L-P, table with shelves	BS-050101-CK
LF-1, laboratory chest of drawers	BS-050101-BK

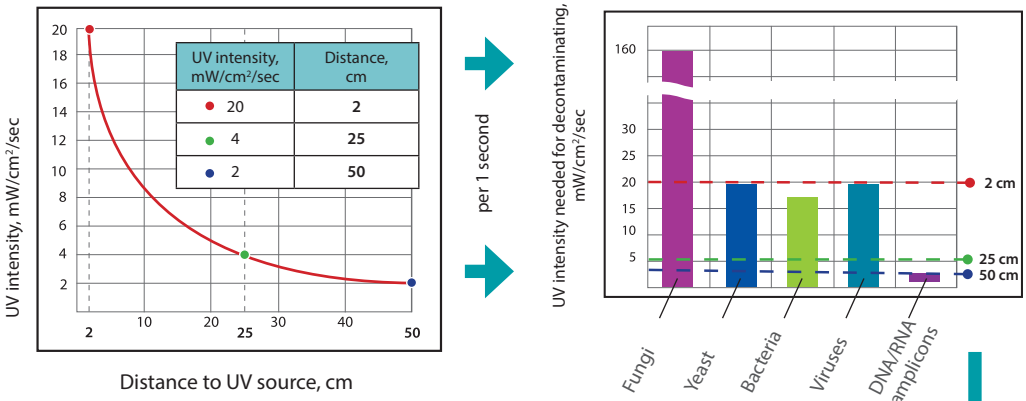
DNA/RNA UV-Cleaner Boxes: Specifications

SPECIFICATIONS

Model	**UVC/T-AR** (compact)	**UVC/T-M-AR** (compact)	**UVT-B-AR** (compact)	**UVT-S-AR** (double size)
Wall materials	Plexiglas: Polymethyl methacrylate (ALTUGLAS EX)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)	Rear: stainless steel, Sides: steel with chemical resistant powder coating Front: glass (EUROGLASS, Germany)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)
Working surface material	Steel with chemicals resistant powder coating	Stainless steel		
Open UV-lamp	1×25W built-in bactericidal (Philips), TUV25WG13 UV-C			2×30W built-in bactericidal lamps (Philips), TUV30WG13 UV-C
UV radiation level	15 mW / cm^2 / sec			
Radiation type	UV (λ = 253.7 nm), ozone-free			
Digital time setting of direct UV exposure	1 min–24 hrs / non–stop (increment 1 min)			
UV–recirculator	1×25 W (efficiency >99% per 1 hour)			1×30 W (efficiency >99% per 1 hour)
Daylight lamp (for working area illumination)	1×TLD-15W			1×TLD-30W
Thickness of side panels	4 mm	4 mm	2 mm	4 mm
Thickness of upper front panel	8 mm			
Thickness of the front protective screen	8 mm	4 mm	4 mm	5 mm
Optical transmission	92%	95%		
UV protection	>99.90% Polymethyl methacrylate ALTUGLAS EX	>96% UV-protection film, type 4 MIL CLEAR		
Working area dimensions	650×475 mm			1200×520 mm
Safety features	Automatic open UV-lamp switch off when screen is open			
Power outlets inside the unit	Inlet for power cords	Inlet for power cords or 1 Built-in socket, max. 1,000 W (pls, order respectively)		3 Built-in sockets max. 1,000 W
Nominal operating voltage	100–240 V, 50/60 Hz			230 V, 50 Hz or 120 V, 60 Hz
Power consumption (230 / 120 V)	67 W			315 VA (1.4 A) / 530 VA (4.5 A)
Overall dimensions (W×D×H)	690×535×555 mm		690×585×555 mm	1245×585×585 mm
Weight (net / gross)	23 / 33 kg	28,8 / 39 kg	31,2 / 42 kg	58 / 68.5 kg
Optional table (see lab. furniture on page 105)	**T-4** (W×D×H : 800×600×745 mm)			**T-4L** (W×D×H : 1290×600×770 mm

DNA/RNA UV-Cleaner Boxes

Germicidal, shortwave (254 nm) ultraviolet energy is used for complete destruction of various biological agents



per 15-30 minutes

Yeast

- Saccharomyces cerevisiae
- Brewer's yeast

Bacteria

- Clostridium tetani
- Mycobacterium tuberculosis
- Salmonella
- Dysentery bacilli
- Staphylococcus aureus
- Streptococcus hemolyticus

Viruses

- Bacteriophage (E. coli)
- Influenza

Average dosage for different surfaces

Surface	Dosage after 15 min	Dosage after 30 min
Working surface (40-60 cm)	1,800-2,700 mW/cm2	3,600-5,400 mW/cm2
Side walls (10-60 cm)	1,800-5,400 mW/cm2	3,600-9,000 mW/cm2
Front window (10-60 cm)	1,800-5,400 mW/cm2	3,600-9,000 mW/cm2

See the article on page 115 for full information

UVC/T-AR

UVC/T-M-AR

ULTRAPURE WATER SYSTEMS: Labaqua series

DESCRIPTION

Labaqua ultrapure systems are multi-purpose water purification systems. The Labaqua systems produce ultrapure and pure water directly from tap water.

Labaqua Ultrapure systems are available in the following configurations:

- **Labaqua HPLC** produces water with very low organic carbon (TOC) content meeting requirements of liquid chromatography methods. Labaqua HPLC water can also be used for some microbiological and molecular biology applications
- **Labaqua Bio** system produces water with very low organic and RNase/DNase content that is intended for the use in molecular biology, including RNase-sensitive applications

Any configuration of a Labaqua ultrapure system produces both ultrapure and pure water. Ultrapure (Grade 1) water is dispensed through the point-of-use filter on the front panel. Pure (Grade 2) water is dispensed directly from the storage tank.

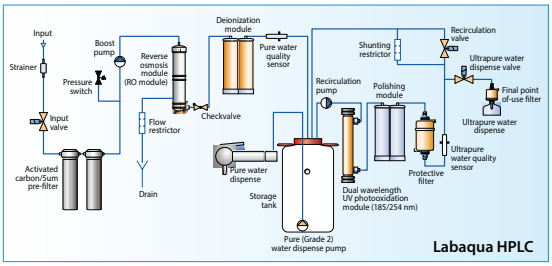
Labaqua ultrapure water can be used for the most demanding applications including, but not limited to: I**norganic trace analysis, Liquid chromatography, Cell culture, Molecular biology**.

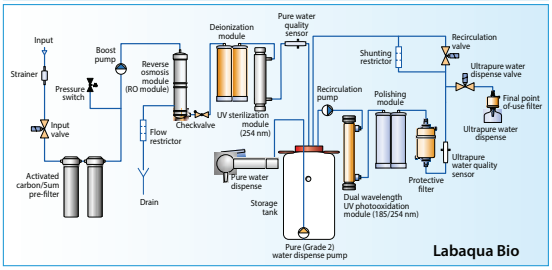
With resistivity of 18.2 Mega — Ohm*cm (0.055 µS/cm) ultrapure water produced by a Labaqua system exceeds requirements of all relevant standards (ISO 3696 Grade 1, ASTM Type I, CLSI Type I). Purified water is collected in a storage tank. An integrated recirculation system ensures consistent quality of water and reduces total organic carbon (TOC) to very low levels: <2ppb.

Pure water produced by the Labaqua systems complies with the requirements of ISO 3696 Grade 2 water and can be used for labware washing, wet chemistry methods, flame spectrophotometers, etc. The dispense rate of ultrapure water is 2 L/min. Whereas the dispense rate of pure water is 4 L/min.

All Labaqua systems have a controller with a graphic LCD display for water quality indication. The LCD display provides all necessary information about system status, as well as the remaining pre-filter life and deionization (DI) module performance. The smart DI module monitoring system also provides a reduction in running costs. A user is instructed to replace the DI module only when the module is near the end of its service life.

All cartridges and filters are easily accessible and no tools are required to replace them. The Labaqua system can be installed on a laboratory bench or mounted on a wall.





Application	Labaqua HPLC	Labaqua Bio
Reagent preparation	yes	yes
Ion chromatography	yes	yes
ICP-MS	yes	yes
Atomic absorption spectrophotometry with graphite atomizer	yes	yes
ICP-OES	yes	yes
HPLC	yes	yes
Gas chromatography	yes	yes
Total Organic Carbon measurement	yes	yes
Flow cytometry	N/A	yes
Cell and tissue culture	N/A	yes
Molecular biology	N/A	yes

ULTRAPURE WATER SYSTEMS: Labaqua series

The Labaqua has important safety functions:
- Tank filling control
- Tap water pressure control
- Protection from tank sensor failure

The Labaqua systems include:
- Boost pump
- Pre-filter set
- Reverse osmosis module
- Deionization module
- Final stage polishing module
- 25L storage tank with an integrated Grade II dispensing pump
- Recirculation system

Model specific modules:
- **Labaqua HPLC** – Point-of-use microfilter
- **Labaqua HPLC with TOC monitor** – Point-of-use microfilter, Integrated TOC monitor
- **Labaqua BIO** – Point-of-use ultrafilter, UV sterilization module

ORDERING INFORMATION:	Cat. number
Labaqua Bio	BS-070101-A02
Labaqua HPLC	BS-070102-A02
Labaqua HPLC with TOC monitor	BS-070103-A02

SPECIFICATIONS

Purified water specifications	Labaqua HPLC	Labaqua Bio
Pure (Grade 2) water resistivity	> 10 MΩ x cm	> 10 MΩ x cm
Pure (Grade 2) water conductivity	< 0.1 µS/cm	< 0.1 µS/cm
Ultrapure (Grade 1) water resistivity	18.2 MΩ x cm	18.2 MΩ x cm
Ultrapure (Grade 1) water conductivity	0.055 µS/cm	0.055 µS/cm
TOC	< 2 ppb	< 2 ppb
RNase	N/A	< 0.01 ng/mL
DNase	N/A	< 4 pg/µL
Bacteria	< 1 cfu/mL	< 1 cfu/mL
Endotoxins	< 0.15 EU/mL	< 0.001 EU/mL
Particles > 0.22 µm	< 1/ per mL	< 1/ per mL
Nominal flow, pure water (to storage tank)	10 L/h	10 L/h
Nominal dispense flow, ultrapure water	2 L/min	2 L/min
Nominal dispense flow, pure water	4 L/min	4 L/min
Deionization module life (standard module)	1 m^3	1 m^3
Recovery	> 30 %	> 30 %
Dimensions (W×D×H), cm	50×40×60	50×40×60
Storage tank	25 L	25 L
Tank dimensions (W×D×H), cm	30×25×50	30×25×50
Feed water pressure	0.5 – 5 bar	0.5 – 5 bar
Feed water conductivity	< 900 µS/cm	< 900 µS/cm

Optional accessories	Cat. number
0.22 um air vent filter for the storage tank	BS-070102-AK
RO membrane for higher capacity (20 L/h)	BS-070102-BK
Electrodeionization module 10 - 30 L/h	BS-070102-CK
Water storage tank "Comfort" w/ level switch, dispense pump, 60 L	BS-070102-EK
50 L water storage tank "Economy" w/ level switch, pump	BS-070102-DK
Storage tank "Comfort" w/dispense pump, 100L	BS-070102-FK
Storage tank "Comfort" w/dispense pump, 200L	BS-070102-GK
Storage tank "Comfort" w/dispense pump, 300L	BS-070102-HK
IQ/OQ documentation	BS-070102-IK
Tap water filters (for clean tap water with hardness < 130ppm CaCO3):	
Pre-filter housing 10" w/ fittings (for clean tap water)	BS-070102-JK
Sediment filter 1 um (for clean tap water)	BS-070102-KK
Tap water filters (for muddy and/or hard tap water with hardness > 130 ppm CaCO3):	
Pre-filter set 3 x 10" w/cartridges (polyphosphate, 5 um + 1 um) for muddy/hard tap water	BS-070102-LK

TLC-S, Thermostated Laminar Flow Cabinet

DESCRIPTION

Thermostated Laminar Flow Cabinet **TLC-S** is a laminar flow biological safety cabinet with HEPA filters that is intended for processing of biological materials. The device is designed for use in laboratories focused on DNA analysis, genetic engineering, molecular biology and laboratories working with cell cultures. Besides HEPA-filtered sterilie airflow the cabinet has two more additional options:

1. Termostated laminar flow of sterilized air.
2. Recirculation systems with ultraviolet light irradiation to inactivate viral particles, DNA and RNA amplicons in the recirculated air.

1. LAMINAR AIRFLOW

Highly efficient filtration is provided by two pleated HEPA filters that meet the requirements of protection class H14. Filters installed in a cabinet, are effective not less than 99.995% if trapping particles of 0.3 micron. In a standard mode, the inflow air enters through the perforated front grille, without penetrating into the working area. The recirculated air in the working area enters the grille in the perimeter of the working area. All the air then flows upwards, where 70% of the air is recirculated through the main HEPA filter and is directed to the working area as a laminar flow, while 30% of the air is directed out of the cabinet through the second HEPA filter. The intensity of the fan is adjusted automatically, keeping the speed of the laminar flow in the cabinet within 0.25 - 0.50 m/s in accordance with the requirements of BSC Class 2 and EN 12469. Working area of the cabinet is surrounded by negative pressure, preventing the interaction of the product and the operator.

2. THERMOSTATED AIRFLOW

Due to the recirculation of the preheated air, we guarantee not only thermostated working surface, but also uniform temperature distribution within the entire working area of the cabinet. As a result, the instruments (shakers, rockers, centrifuge-vortex), materials (pipetts, pipette tips, racks), reagents (kits for cultivation and differentiation of cells, culture media), and cell lines or inoculum - all of the above is at the same temperature. The preheated airflow protects cell lines from a possible heat shock and prevents condensation of liquid on the walls of the cell culture vessels through the uniform temperature distribution within the laminar flow cabinet.

ANNOUNCEMENT

3. PHYSICAL INACTIVATION OF THE DNA/RNA MOLECULES IN THE AIRFLOW

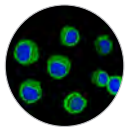
TLC-S is equipped with a UV air recirculation system- 4 UV lamps, mounted behind the rear wall of the cabinet, continuously disinfect the airflow. UV air recirculators - as has been shown previously by BioSan [1] - are highly effective in the inactivation of infectious biological materials which size is much smaller than the pores of HEPA-filter (less than 0.3 micron) - such as viruses, DNA/RNA fragments and amplicons.

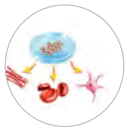
[1] Development and evaluation of DNA amplicon quantification.

MARKET:

Biotechnology

Molecular biology


Cell biology


Stem cells technology

TLC-S, Thermostated Laminar Flow Cabinet

PROTECTION OF THE PRODUCT,
THE OPERATOR AND ENVIRONMENT

TTL-S moving table for the cabinet

INFORMATION ABOUT THE AVAILABILITY OF THE DEVICE AND LATEST UPDATES WILL BE PUBLISHED ON OUR WEBSITE WWW.BIOSAN.LV

FILTER SPECIFICATIONS

Installed HEPA filter class according to EN 1822-1:2009	H14
Efficiency of HEPA filters	99.995%
HEPA filter dimensions:	main – 457×610×68 mm additional – 305×305×68 mm
Downflow air speed range **in Standard mode**	0,25 - 0,50 m/s
Recirculation level in the cabinet	70%
Noise level: front sash raised front sash closed	≤60 dBA ≤50 dBA

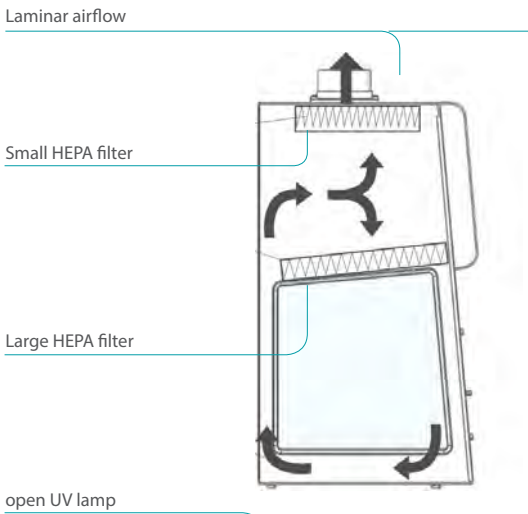
TEMPERATURE SPECIFICATIONS

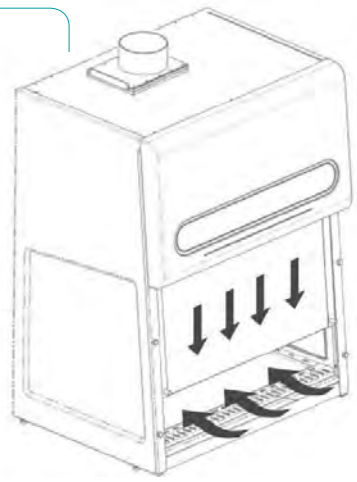
Setting range	+25°C to +37°C
Regulation range	5°C above RT to +37°C
Stability at +37°C	±1,5°C

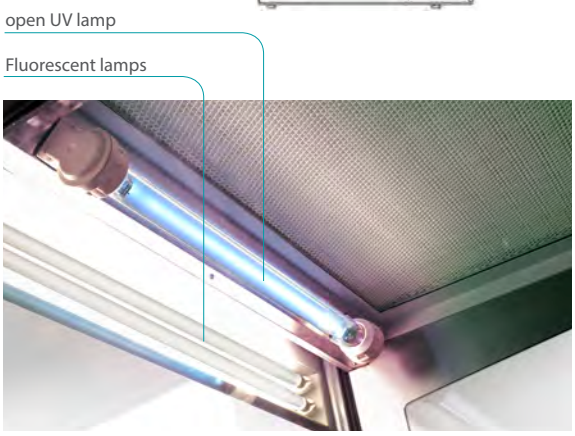
GENERAL SPECIFICATIONS

Bactericidal UV lamp (in the cabinet) Bactericidal UV lamp (in the recirculator)	1×TUV 25Вт T8 G13 4×TUV 25Вт T8 G13
UV radiation type	UV (254 nm), w/o ozone
Average UV lamp life time	9000 h
Digital time setting	1 min – 96 h 59 min
Luminiscent lamps	2×24W/ 830 T5 G5
Work area luminosity	≥1000 Lk
Glass type	Euroglass (DE)
Protection film	4 MIL CLEAR
Transparency	95%
UV protection	≥96%
Glass width (front, sides)	4 mm
Front cover opening height	245 mm
Input cover / power consumption	230 V, 50 Hz / 5.5 A, 1250 W
Built-in mains outlet	1 pce, IP44
Mains outlet maximum power	600 W
Fan power	≤400 W
Heating element power	800 W
Work area	590×510 mm
Cabinet inner size	645×575×420 mm
Dimensions (W×D×H)	700×730×995 mm
Weight	88 kg
Placement	desktop

TLC-S, Thermostated Laminar Flow Cabinet







ORDERING INFORMATION: Cat. number

TLC-S Thermostated Laminar Flow Cabinet	BS-040114-AAA
TTL-S Moving table for the cabinet	BS-040114-AK

Optional accessories:

TTL-S Moving table for the cabinet

Dimensions (l×w×h)	800×750×770 mm
Load up to	200 kg

Consumables:

Name	Description	Cat. number
Small HEPA filter	H14 class, 305×305×68 mm	BS-040114-S28
Large HEPA filter	H14 class, 457×610×68 mm	BS-040114-S29
UV lamp	TUV 25 W, T8, G13	BS-040114-S18
Fluorescent lamp	24 W, T5, G5	BS-040114-S19
Fuse	M 8.0 A	BS-040114-S27

CATALOGUE 2015-2016

PHOTOMETERS

DEN-1 and DEN-1B, McFarland Densitometers

DESCRIPTION

Densitometers are designed for measurement of cell suspension's turbidity in the range:

DEN-1: 0.3–5.0 McFarland units (100×10^6–150×10^7 cells/ml);

DEN-1B: 0.0–6.0 McFarland units (0–180×10^7 cells/ml);

Densitometers provide the opportunity to measure solution turbidity in a wider range (up to 15.0 McFarland units) however, it is necessary to remember that in this case the standard deviation values increase.

A densitometer is used for measurement of cell concentration (bacterial, yeast cells) during fermentation process, determination of microorganism sensitivity to antibiotics, microorganism identification using various test-systems, for measurement of absorption at the definite wavelength, as well as for quantitative estimation of concentration of colour solution, absorbing green light.

The operation principle is based on measurement of optical density with digital presentation of results in McFarland units. The unit is calibrated at the factory (for operation with 18 mm diameter glass tubes) and keeps calibration without power supply. However, if necessary it is possible to calibrate the unit by 2–6 points in 0.5–5.0 (DEN-1) and 0.0-6.0 (DEN-1B) McFarland unit range. Both commercial standards (e.g. produced by BioMerieux, Lachema, etc.) and the cell suspensions prepared in a laboratory can be used for calibration.

Following calibration kits are available on request:

- **CKG16** for glass tubes with diameter 16 mm;
- **CKG18** for glass tubes with diameter 18 mm.

Up to date information on calibration kits is can be found on the website: http://www.biosan.lv

Two versions of the product are available:

1. DEN-1 powered from external energy supply;

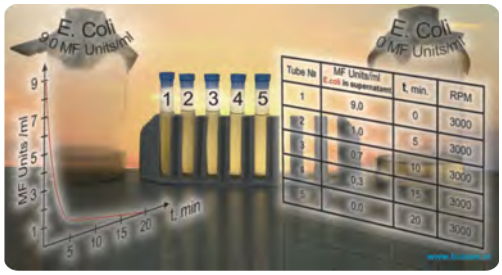
2. DEN-1B powered both from external energy supply and from batteries (AA). Besides, **DEN-1B** operates with higher precision of measurements (up to 0.01 McF).

DEN-1B

DEN-1

A A-16

DEN-1B rear side with calibration controls



Application of **DEN-1** for determining concentration of microbial cells of supernatant in tubes during centrifugation. Turbidity is determined in McFarland units.

DEN-1 and DEN-1B, McFarland Densitometers

	DEN-1	DEN-1B
Light source	LED	
Wavelength	λ = 565 ±15 nm	
Measurement range	0.3–15.0 McF	0.00–15.00 McF
Display resolution	0.1 McF	0.01 McF
Accuracy, of the full scale	±3%	
Measurement time	1 sec	
Sample volume	not less than 2 ml	
Tube external diameter	18 mm (without adapter) or 16 mm (using optional Ⓐ **A-16** adapter)	
Possibility to restore factory calibration settings	NEW FUNCTION	
Display	LED	LCD
Overall dimensions (W×D×H)	165×115×75 mm	
Weight	0.7 kg	
Independent power supply	—	3×AA batteries
Input current/power consumption	12 V, 80 mA/1 W	12 V, 7 mA/0.1 W
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V	Input AC 100-240 V, 50/60 Hz, Output DC 12 V
Standard set	External power supply	External power supply or 3×AA batteries

ORDERING INFORMATION: Cat. number

DEN-1	BS-050102-AAF
DEN-1B	BS-050104-AAF

Optional accessories:

CKG16	BS-050102-BK
for glass tubes with diameter 16 mm;	
CKG18	BS-050102-CK
for glass tubes with diameter 18 mm;	
A-16, adapter	BS-050102-AK

DEN-1B

HiPo MPP-96, Microplate Photometer

DESCRIPTION

Microplate Photometer Hipo is a compact tabletop device for measuring the results of ELISA and microbiological studies in 96-well microplates. Photometer is controlled outputs data via computer. The device is supplied with specialized software QuantAssay.

Features of QuantAssay software:

- ELISa assays of any complexity can be carried out via robust assay editor
- Multiplex assays -up to 7 assays on one plate
- Qualitative assay includes up to 8 controls
- Quantitative assay includes up to 20 standards
- BestFit function for selecting the best calibration curve
- Save, load and export results
- Creating visual reports

ANNOUNCEMENT

INFORMATION ABOUT THE AVAILABILITY OF THE DEVICE WILL BE PUBLISHED ON OUR WEBSITE WWW.BIOSAN.LV

SPECIFICATIONS

Detection mode	Absorbance
Light source	LED, self-calibrating
Photodetector	8 silicon photodiodes
Plate type	96-well microplates (including strip-well microplates)
Reading Speed	5 s per wavelength
Measurement modes	Endpoint, kinetic and multi-label measurements
Measurement channels	8
Reference channel	1
Measurement range	0 – 4.3 OD
Resolution	0.0001 OD
Wavelength range	400 – 750 nm
Wavelength selection	up to 8* filters on wheel standard filters 405, 450, 492 and 620 nm
Shaking	4 amplitudes, 4 speeds
Software	**QuantAssay**
PC system requirements	Intel/AMD Processor, 1 GB RAM, Windows Vista/7/8, 2.0 USB
Overall dimensions (W×D×H)	140 × 300 × 130 mm
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V

* — up to 4 custom filters can be fitted on demand

Accuracy at 450 / 492 nm	
0.000 – 2.000 OD	≤ (0.5 % ± 0.010 OD) typical
2.000 – 3.000 OD	≤ (1 % ± 0.010 OD) typical
Precision / Reproducibility at 450 / 492 nm	
0.000 – 2.000 OD	≤ (0.5 % ± 0.005 OD)
2.000 – 3.000 OD	≤ (1.0 % ± 0.005 OD)
Linearity	
0.000 – 2.000 OD	≤ 1.0 %
2.000 – 3.000 OD	≤ 1.5 %

ORDERING INFORMATION:	Cat. number
HiPo MPP-96	BS-050108-A02
Optional accessories:	
Calibration Plate	BS-050108-AK

CATALOGUE 2015-2016

WASHERS, ASPIRATOR

IW-8, Intelispeed Washer

DESCRIPTION

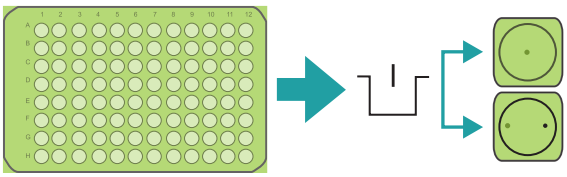
Intelispeed Washer IW-8 is designed for washing of standard flat-bottom 96 well plates and microstrips. The unit is fully programmable ensuring multi-step solution ripening, aspiration (aspiration, combination of aspiration/liquid dispensing and soaking, as well as soaking cycle during a particular period of time).

The unit has 100 user-defined programs. Standard version is supplied with 8-channel washing head for dispensing/aspiration, 3 bottles for washing and rinsing solutions, a waste bottle and bottle with filter. Optional 4-channel washing solution weight logger, **4 CHW Logger** is available.

The unit is designed for washing standard 96-well plates during analyses.

The unit provides:

- Washing mode
- Rinsing mode
- Mixing mode
- Double aspiration
- Possibility of additional solution mixing during time gap between two work cycles
- Possibility to use microtest plates by different manufacturers, ensured by automated plate set up (adjusting to different depths of plate wells)
- Plate and strip washing mode
- User-defined programs with adjustable parameters
- Saving work programs



ORDERING INFORMATION:	Cat. number
IW-8	BS-060106-AAI
4 CHW Logger	BS-060102-AK

IW-8, Intelispeed Washer

4-channel washing solution weight logger, **4 CHW Logger** provides automatic control of rinsing solution and waste volumes. The washer shows remaining volume for each bottle as percentage and gives a warning message in case of low solution volume or full waste bottle when **4 CHW Logger** is connected.

4 CHW Logger Specifications:

Max. loading per scale cup	2 kg
Dimensions	267 × 252 × 97 mm
Weight	3 kg

SPECIFICATIONS

Choice of 3 washing liquid bottles	
Minimum dispense volume	25 µl
Maximum dispense volume	1,600 µl
Dispense increment	25 µl
Dispensing accuracy	±2.5%
Allowed residual liquid volume no more than 2 µl in plate well	
Number of wells washed simultaneously	8
Number of washing cycles for each channel	1–15
Aspiration time	0.2–3 sec
Aspiration/dispensing speed	3 levels
Max. number of channels in a program	2
Soaking time	0–300 sec (increment 10 sec)
Shaking time	0–150 (increment 5 sec)
Number of washed rows	1–12
Time of plate single wash (350 µl), no more	45 sec
Number of programs	100
Plate platform and washing head movement	automated
Indication of operation modes	8-line LCD
Dimensions (W × D × H)	375×345×180 mm
Weight with accessories	11 kg
External power supply	DC 12 V, 5 A
Consumed power, not more	60 W
The unit is designed for use in closed laboratory rooms at temperatures from +10 to +35°C and relative humidity up to 80% at +25°C decreasing linearly to 50% relative humidity at 35°C	

3D-IW8, Inteliwasher

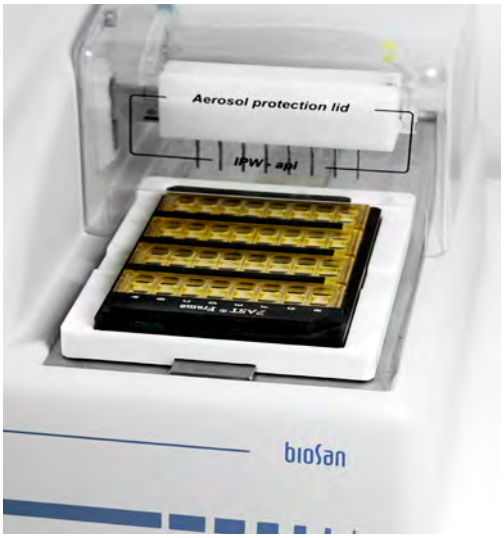
Product video is available on the website

DESCRIPTION

Inteliwasher **3D-IW8** series microplate washer is designed for washing various types of standard 96-well microtitre plates, microstrips as well as microarrays on FastFRAME (rectangular well shape). It is suitable for washing wells with different bottom shapes: flat, U-shape and V-shape. The unit is fully programmable ensuring multi-step solution ripening, aspiration (aspiration, combination of aspiration/liquid dispensing and soaking, as well as soaking cycle during a particular period of time). Dispense system of liquid dosage for each channel separately.

THE UNIT PROVIDES:

- Washing mode
- Rinsing mode
- Mixing mode
- Single point, two point, circular (circle or rectangular path) aspiration
- Possibility of additional solution mixing during time gap between two work cycles
- Possibility to use microtest plates by different manufacturers, ensured by automated plate set up (adjusting to different depths of plate wells)
- Round-bottom plate and strip washing mode
- Possibility of user-defined programs with adjustable parameters



ORDERING INFORMATION:

	Cat. number
3D-IW8	BS-060102-AAI
4 CHW Logger	BS-060102-AK

3D-IW8, Inteliwasher

SPECIFICATIONS

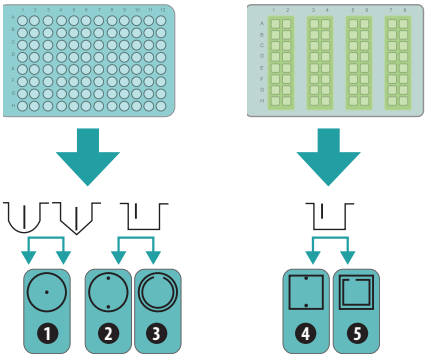
Minimum dispense volume	25 µl
Maximum dispense volume	1,600 µl
Dispense increment	25 µl
Dispensing accuracy	±2.5%
Allowed residual liquid volume in plate well, not more	2 µl
Number of wells washed simultaneously	8
Number of washing cycles	1–15
Aspiration time	1–3 sec
Final aspiration time	1–3 sec
Aspiration/dispensing speed	3 levels
Max. number of channels in a program	2
Choice of 3 washing liquid bottles	
Soaking time	0–300 sec (increment 10 sec)
Shaking time	0–150 sec (increment 5 sec)
Number of washed rows	1–12
Time of one plate wash (300 µl), not more	45 sec
Number of programs	50
Plate platform and washing head movement	automated
Indication of operation modes	LCD, 8-line
Dimensions (W×D×H)	375×345×180 mm
Weight with accessories	9 kg
External power supply	DC 12 V, 4.16 A
Consumed power, not more	60 W

The unit is designed for use in closed laboratory rooms at temperatures from +10°C to +35°C and relative humidity up to 80% at +25°C decreasing linearly to 50% relative humidity at 35°C.

The unit has 50 programs divided into 5 following aspiration categories (see figure bellow):

1. **Type 1** (1.0–1.9) **IPF96 U/V** is intended for round and V-shape immunoplates, 1 point aspiration.
2. **Type 2** (2.0–2.9) **IPF96 FLAT-2** is intended for flat-bottom shape immunoplates, 2 point aspiration.
3. **Type 3** (3.0–3.9) **IPF96 FLAT-C** is intended for rectangular shape immunoplates, full-circle aspiration direction.
4. **Type 4** (4.0–4.9) **FastFRAME-2** is intended for multi-slide plate* with rectangular wells.
5. **Type 5** (5.0–5.9) **FastFRAME-C** is intended for multi-slide* plate with rectangular wells.

* — The **FastFRAME** (Schleicher&Shuel) multi-slide plate or analog plate of another manufacturer, that is compatible with standard 25×76 mm (1×3 inch) glass slides.



4-channel washing solution weight logger, **4 CHW Logger** provides automatic control of rinsing solution and waste volumes. The washer shows remaining volume for each bottle as percentage and gives a warning message in case of low solution volume or full waste bottle when **4 CHW Logger** is connected.

4 CHW LOGGER SPECIFICATIONS:

Max. loading per scale cup	2 kg
Dimensions	267×252×97 mm
Weight	3 kg

FTA-1, Aspirator with Trap Flask

DESCRIPTION

Aspirator with trap flask **FTA-1** is designed for aspiration/removal of alcohol/buffer remaining quantities from microtest tube walls during DNA/RNA purification and other macromolecule reprecipitation techniques.

The device can be used also for routine operations of cells washing from culture medium and resuspension in buffer. Aspirator operation principle is based on creating negative pressure in trapping flask using built-in micro-compressor. The collecting tip is connected with polyethylene tube to the trapping flask. Liquid is removed from the microtest tube when the collecting tip touches the solution surface. A tube holder-organizer is conveniently located at **FTA-1** right hand side; it accommodates two tubes (e.g. for hydrochloric acid solution and distillate) necessary for collecting tip washing and storing, so that a tip can be re-used.

❶ Suction hydrophobic microbiological filter

❶ Suction microbiological hydrophobic filter type 2200/02:

Suction microbiologic filter eliminated risk of contamination with bacteria, viruses and infected particle from patient to suction pump or central vacuum distribution. Suction microbiological filter is hydrophobic with very high bacterial efficiencies up to 99.99999% particles bigger than 0.027 micron (which is smaller than Hepatitis A, B and C).

Applications: Suction filter located behind output of the jar in front of the vacuum source. The filter put on so as the side of filter marked „IN" was directed to the jar and the side without marked to the vacuum source.

Exchange: The filter is necessary replaced, as it is glazed with dirtiness or by liquid sucked. Maximum using time is 30 days. After ending of suction of infection patient we recommended immediately exchanged the filter. It prevents spread of infection.

Product video is available on the website

Optional 8-channel adapter manifold MA-8

SPECIFICATIONS

Vacuum	–500 mbar
Trap flask's volume	1 litre
Dimensions (W×D×H)	160×210×340 mm with trap flask
Weight with trap flask	1.7 kg
Input current/power consumption	12 V, 300 mA / 3.6 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

ORDERING INFORMATION:	Cat. number
FTA-1 with 1l trap flask	BS-040108-AAG
Optional accessories:	
MA-8	BS-040108-BK
Replacement parts:	
Suction microbiologic hydrophobic filter	BS-040108-S25

Laboratory Furniture

Table **T-4**

LF-1, laboratory chest of drawers

Table **T-4L-P**

Table T-4L, with PCR–cabinet **UVT-S-AR**, 2 chests of drawers **LF-1** and equipment for nucleic acid extraction

Table with shelves **T-4L-P**, chests of drawers **LF-1** and equipment for nucleic acid extraction

T-4:	
Weight	23 kg
Overall dimensions (W×D×H)	800×600×745 mm

T-4L:	
Weight	36 kg
Overall dimensions (W×D×H)	1290×600×770 mm

T-4L-P:	
Weight	54 kg
Overall dimensions (W×D×H)	1290×600×1670 mm

LF-1:	
Weight	28 kg
Overall dimensions (W×D×H)	300×450×705 mm

ORDERING INFORMATION:	Cat. number
T-4	BS-040101-BK
T-4L	BS-040107-BK
T-4L-P	BS-050101-CK
LF-1	BS-050101-BK

SAFETY

All Biosan laboratory equipment meets the requirements of International Standard IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, and applicable specific parts e.g. IEC 61010-2-010: requirements for laboratory equipment for the thermostating equipment, IEC 61010-2-020: for centrifugation equipment, IEC 61010-2-051: for magnetic stirrers.

CE MARK

All Biosan laboratory equipment bears a CE mark to indicate that it meets the requirements of all applicable European Directives.

Compliance with the Low Voltage Directive is demonstrated by meeting EN 61010 (as indicating in paragraph on safety) and the EMC Directive by meeting EN61326-1: EMC requirements for electrical equipment for measurement, control and laboratory use.

ELECTRICAL SUPPLIES

All standard Biosan laboratory equipment is available for voltages within the range 220–240 V, 50 or 60 Hz. Most of the equipment is also available for voltages 100–120 V, 50 or 60 Hz.

ENVIRONMENTAL CONDITIONS

Biosan laboratory equipment is designed for indoor use in laboratory conditions, with room temperature between +4°C and +40°C, and 80% relative humidity up to +31°C unless stated otherwise.

QUALITY

The Biosan Quality Management System complies with the requirements of LVS EN ISO 9001:2009, the scope of supply is development, production, sales and service of laboratory equipment.

High quality customer service and readiness to meet ever growing customer requirements to modern equipment are the main goals of ISO 9001:2009 compliance (certified since 2004).

GUARANTEE AND AFTER SALES SERVICE

Biosan equipment is reliable, designed and built to provide years of trouble-free service. Most Biosan equipment is guaranteed for two years against faulty materials and workmanship. Warranty terms and conditions are indicated in the product manual. All Grant standard laboratory equipment is guaranteed for three years against faulty materials and workmanship. Local distributors and service centres provide necessary technical assistance within and outside the warranty period.

Biosan technical support team provides direct support offering the best solution for assistance upon receipt of request via e-mail service@biosan.lv or forms available at Technical Support section of Biosan web-site.

WORLD WIDE AVAILABILITY AND SUPPORT FOR BIOSAN LABORATORY EQUIPMENT

Biosan laboratory equipment and specialist technical support is available world-wide. Please, visit multilingual (English, German, Italian, Latvian, Spanish, Russian) web-site http://www.biosan.lv for further product information (videos, brochures, manuals, articles), placing enquiries and locating your locally appointed distributor or contact customer service direct at service@biosan.lv.

As Biosan is committed to a continuous program of improvement, specifications may be changed without notice.

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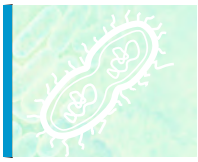

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The World of Biotechnomica

"In the act of creation, man steps beyond himself as a creature and rises above passivity and the coincidence of his existence into the realm of freedom and meaning. In this need to transcend can be found one of the roots not only of love, but of art, religion and material production "

— Erich Fromm

The concept of development for Biosan called The World of Biotechnomica. Four planetary systems with satellites — devices revolve around Terra Innovatica (biomaterial under research). We have marked out four planets — 4 contemporary diagnostic levels:

1. **Terra Genomica** — diagnostics at the level of genes (DNA-analysis, oligonucleotide and mononucleotide polymorphism — ONP, SNP);
2. **Terra Immunologica** — diagnostics at the level of immunology (detection of polymorphism of antibodies and immune response);
3. **Terra Biochemica** (metabolomics) — diagnostics of metabolism products and ferment activity;
4. **Terra Cellomica** — diagnostics at the level of cellular morphogenesis (cellular polymorphism).

The distance from the planet orbitals to Terra Innovatica corresponds to the time of disease detection at each level (from one week, as in the case of DNA-analysis, to several years, when the changes can be traced at the cellular level). By virtue of genetic nature of the majority of diseases of human beings, animals and plants — further affecting the immune response (defence reaction) and changes in biochemical status, and finally cellular morphogenesis as well — we believe that simultaneous multilevel diagnostics is reasonable. Since polymorphism at the level of genes leads to the manifestation of polymorphism at all higher levels, it results in the ambiguity (if not more) of any decision made on the basis of the obtained data. The definition comprising the polymorphism of norm and abnormality (disease) is not yet available; hence, the multidiagnostic technology, though expensive, is the only solution as of today.

Although the classic determinism in diagnostics has finally yielded its position to the stochastic one, there are still no instrumental solutions allowing to channel our new knowledge into informed and unambiguous decisions. This is the real situation; these are the temporary sacrifice of progress. Biosan is the only company in the World of Biotechnomica, which develops, produces and distributes instrument lines for all 4 levels of diagnostics. These

Vasily Bankovsky, Ph.D. (Biology), Head of R&D Department, Chairman of the Board at Biosan

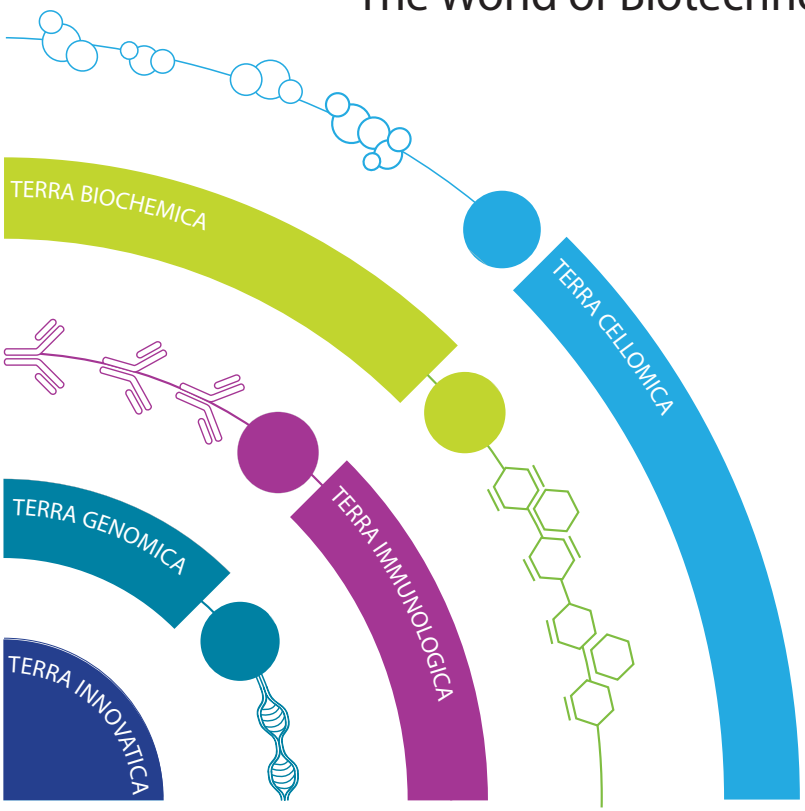
satellites of 4 planets are specialised devices providing the instrumental basis for multilevel diagnostics, whereas the reagent sets make these satellites move. On this account, the term Biotechnomica in our understanding means the branch of biotechnology responsible for the development of multilevel laboratory diagnostics sets (instrument lines). In the future perspective, multidiagnostic chips may appear with the development of chip technologies, allowing to unify all the aforesaid technologies in one chip. Biosan plans to be active in this field in the next few years.

I am pleased to point out that many of our ideas and products have been developed as a result of long-standing cooperation of scientists from the Institute of Microbiology of the Latvian Academy of Science (where our company was founded 23 years ago and where it is presently located) with universities, as well as with academic institutes and institutes of applied sciences and our company customers worldwide.

All our inventions resulted from joint efforts, and today we are still open for collaboration. We will be delighted if the result of our work — which has already received wide recognition of the Western scientific community — would be also of interest for you, particularly if it would serve as yet another starting point for the development of innovative biotechnologies and appearance of new planets and their satellites in the sky of the World of Biotechnomica.

Sincerely,
Vasily Bankovsky, Ph.D. (Biology)
Head of R&D Department
Biosan, Chairman of the Board

The World of Biotechnomica



WORLD OF BIOTECHNOMICA

Reverse–Spin® Technology — Innovative Principle of Microbial Cultivation

Medical–Biological
Research & Technologies

Authors
V. Bankovsky, I. Bankovsky, P. Bankovsky, J. Isakova, I. Djackova, A. Sharipo, A. Zhukov, A. Dišlers, R. Rozenstein, V. Saricev, S. Djacenko, V. Makarenko, U. Balodis.

This paper presents theoretical and experimental studies of the microorganism growth using Reverse–Spin Technology (RST). Reverse–Spinner — is a thermostating device with very low energy consumption that realizes innovative type of mixing, where liquid (cells in liquid medium) is mixed by the tube rotation around its axis, leading to highly efficient Vortex Type Mixing (VTM).

Present work is the first to show experimental results of cell growth kinetics obtained by using disposable falcon tubes agitated on a principle of RST. Growth conditions for several model microorganisms (facultative anaerobe *E.coli BL21*, extreme aerobic microorganism *Thermophillus sp.*, and anaerobic bacteria *Lactobacillus acidophilus*) have been optimized. Scientific and applied valuable aspects of single–used tube RS–Reactors and their potential niche in different biotechnological fields are discussed.

The principles of mixing solutions are among one of the key fields in Bioengineering science. Area of mixing is not limited to bioreactors — mixing is also essential in the study of biochemical and molecular biological processes. Non invasive mixing technology includes a different way of tubes agitation as shown in the table 1.

Absence of agitators inside the reactor gives opportunities to use Reverse Spinner as a rotating spectrophotometer (spectra–cells), which measures optical density in the reactor in Real–Time.

Software makes it possible to set optimal parameters of fermentation, registers and logs all parameters (mixing intensity, temperature of the process, optical density and cell concentration, speed of the growth, etc.).

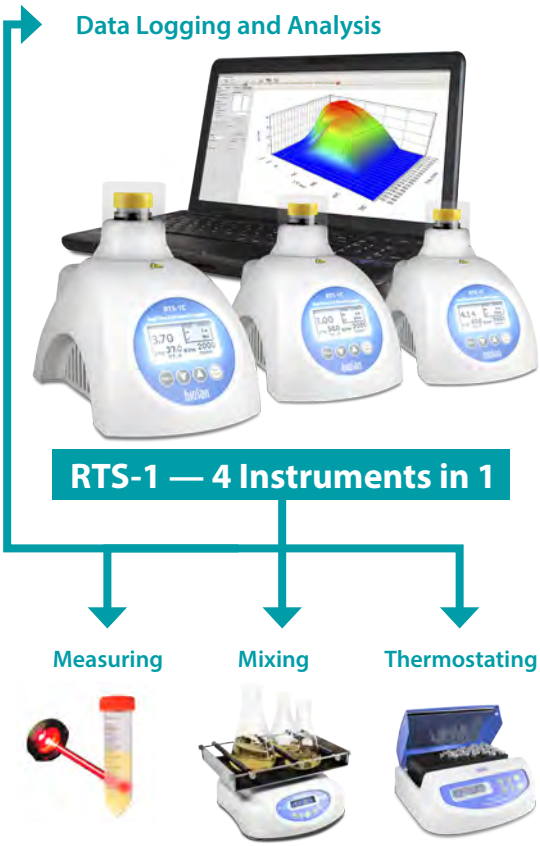


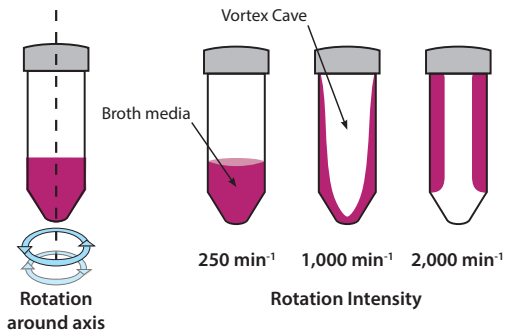
Table 1, Comparison of Non invasive mixing methods

#	Icon	Motion	Instrument	Max. V
1		Orbital		0.1–5 l
2		Rocking		1–100 l
3		Overhead Rotation		1–50 ml
4		Reciprocal (Hand-type)		1–50 ml
5		Vortex		1–50 ml
6		Reverse Spinning		1–2000 ml

Initiation of the Vortex Type Mixing (VTM) and depth of the Vortex cave depend on 1) angular speed of RS–Reactor 2) time from initiating rotation of RS–Reactor 3) growth media viscosity 4) temperature. These parameters, also, determine the angular speed of rotating Vortex Layer (VL) and transition state from the Irrotational Vortex (IRV), when angular speed of the VL is proportional to the radius, to the Rotational Vortex, when the angular speed of the VL is the same and VL looks like a monolithic Vortex cavity. Common rules regulating Vortex type mixing processes may be stated as follows: the more time has passed since Vortex formation, the more obvious is a transition from IRV to the RV. The concept of the Reverse–Spin mixing is based on these assumptions.

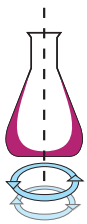
Noninvasive Vortex Mixing Principle

Spread of the broth media inside of rotation tube as a function of rotation intensity



Reverse Spinning vs Orbital Shaking
Symmetrical vs Asymmetrical broth media distribution

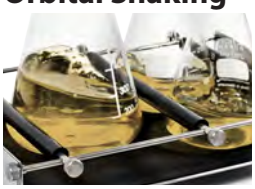
Reverse Spinning

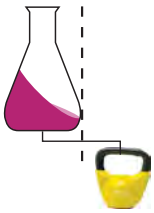


Features:

- Fits any diameter of the rotating vessel
- Natural centric auto–balancing
- Simplicity
- No power consumption for contra–balancing
- Self cleaning optical cells

Orbital Shaking

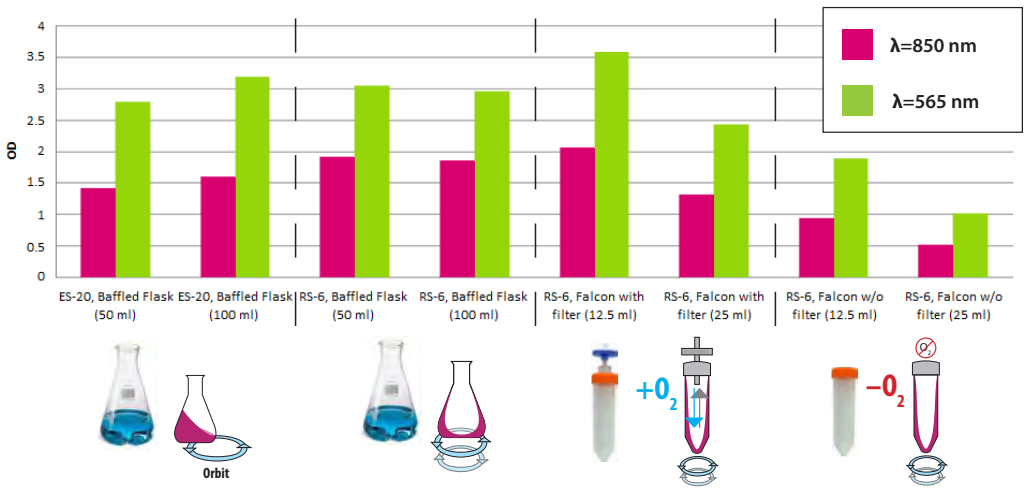




Features:

- Proportionality between orbital diameter and the diameter of the moving vessel
- Artificial hula–hoop auto–balancing
- Complexity
- Extra power consumption for contra-balancing

Fig 1. Aeration effect on E.coli BL21 growth using different growth techniques



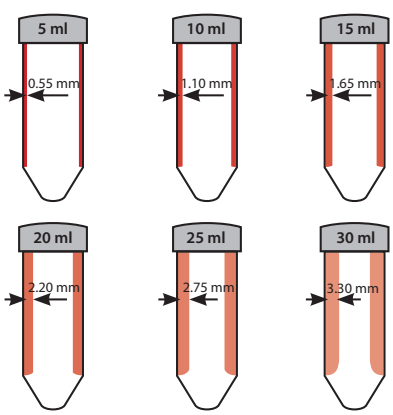
The fig. 1 shows a comparative data of the biomass yield obtained for the E.coli night culture cultivated in LB medium in Erlenmeyer flasks (Shaker–Incubator ES-20, BioSan) and in test-tube reactors, RTS-1. Biomass yield is presented in the optical densities measured at 600 nm and 850 nm wavelengths. The results obtained for a tube rotating around its own axis at a speed up to 2,000 revolutions per minute.

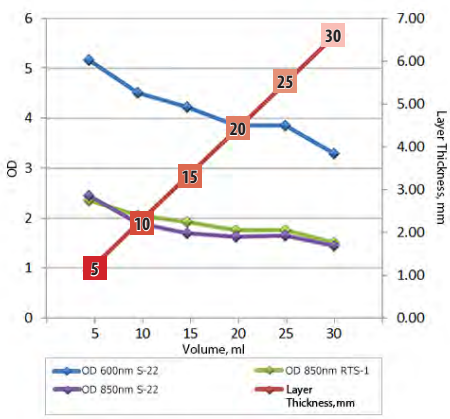
The experimental data suggests that biomass yield obtained using the Reverse Spin Technology is not lower than biomass amount obtained by traditional methods of cultivation and, as is the case of cultivation in Erlenmeyer flasks, depends on the volume of medium in the flask, all other parameters being equal.

Next, we concentrated our efforts on the development of correct cell concentration measurement technology in Real–Time. As you may know, the final concentrations of E. coli cells in LB medium significantly exceed OD=1.0 at λ=600 nm, which requires stopping the process of growing cells, sterile sampling and dilution. This makes the process of growing cells and controlling their concentration very difficult to reproduce. The problem lies in the fact that the turbidimetric coefficients unlike molar extinction coefficients — are not linear. The behaviour of light in dense cell suspensions (see fig. 5) is very interesting and at more than 2 OD at 600 nm it is almost impossible to measure the concentration of cells directly (unless you measure the Rayleigh scattering).

We approached this problem from a different side. It is known that the shorter the optical path is, the more accurately it is possible to measure the concentration of cells, even at high densities (up to 10 OD). For this purpose, test tubes containing different volumes of medium are intensely rotated (2,000 min^{-1}) and as a result, a monolayer of medium is generated, which thickness is directly proportional to the volume of culture medium in the tube (see fig. 2 below). Previously, we achieved linearity in the data, when measuring cell concentrations from 1–10 OD in the optical path of 1 mm, therefore correction coefficients were introduced in the program of RTS-1, which allows to measure concentrations of cells in a wide range. The algorithm for determining the concentration of bacterial cells in Real–Time includes the formation of the monolayer at given intervals and cell concentration measuring process. The process takes 5–10 seconds and then initially set parameters for the cell growth automatically restore. The graph shows that the cell concentration range optimal for measurement is 5–30 ml of culture medium in the reactor.

Fig 2. The effect of Media Volume on it's Layer Thickness (mm) during Reverse-Spin cycle





#	V, ml	RTS-1, ODonline 850nm	RTS-1, Layer Thickness, mm	RTS-1, Optical Path, mm	S-22, ODoff-line 850nm, 1mm cuvette	S-22, ODoff-line 600nm, 1mm cuvette	Cells Yield, 600 nm
1	5	2.45	0.55	1.10	2.35	5.17	25.8
2	10	1.92	1.10	2.20	2.05	4.51	45.1
3	15	1.71	1.65	3.30	1.92	4.22	63.3
4	20	1.62	2.20	4.40	1.75	3.85	77.0
5	25	1.65	2.25	5.50	1.75	3.85	96.2
6	30	1.45	3.30	6.60	1.50	3.30	99.0

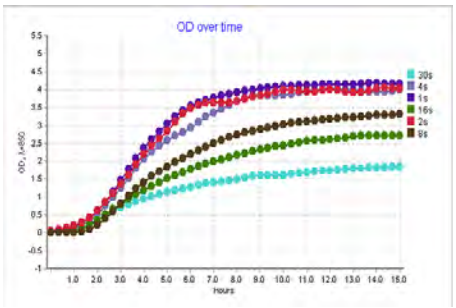


Fig 3. Influence of Frequency of Reverse Spinning on the Growth kinetics and Growth Rate (ΔOD(λ=850nm)/Δt) vs Time of fermentation (hrs).
Legend of experiment: Real Time Cell Growth Logger was used — RTS-1 with 850 nm LED, Volume of LB media in 50 ml Falcon = 15 ml approx., Reverse Spin Frequency (RSF) 1, 2, 4, 8, 16, 30 sec $^{-1}$, Measurements frequency (MF) is 10 min^{-1} approx., Rotation speed of reactor = 2,000 rpm , temperature 37°C , Diameter of filters` pores (for aeration) = 0.25 µm .

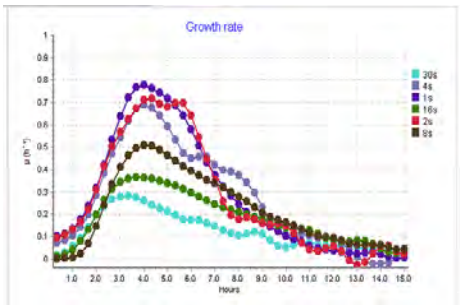
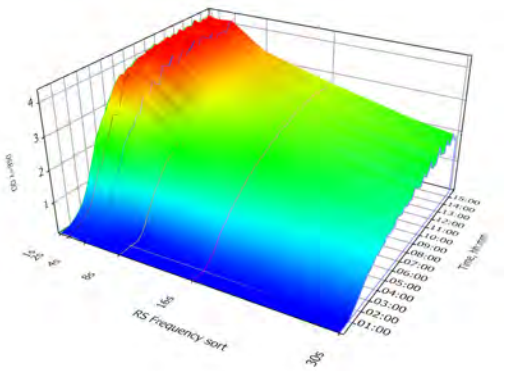
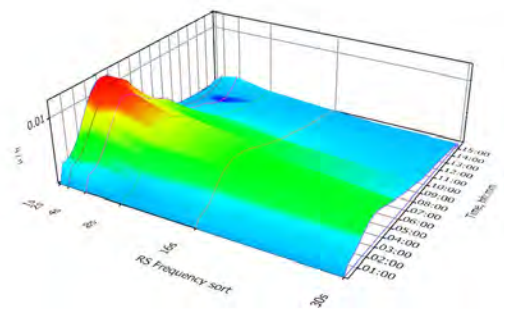


Fig 4. Influence of Frequency of Reverse Spinning on the Growth Kinetics vs Time of fermentation of E.coli BL21 in a 3D model.





Results obtained indicate that the maximum rate of cell division is detected at a frequency of 1 Reverse Spin per second (1 sec^{-1}) at a speed of 2,000 rpm. The increase of pause between reverse spins reduces cell growth rate, reaching 50% of the maximum value, when RS freq. = 30 sec (see fig 3.).

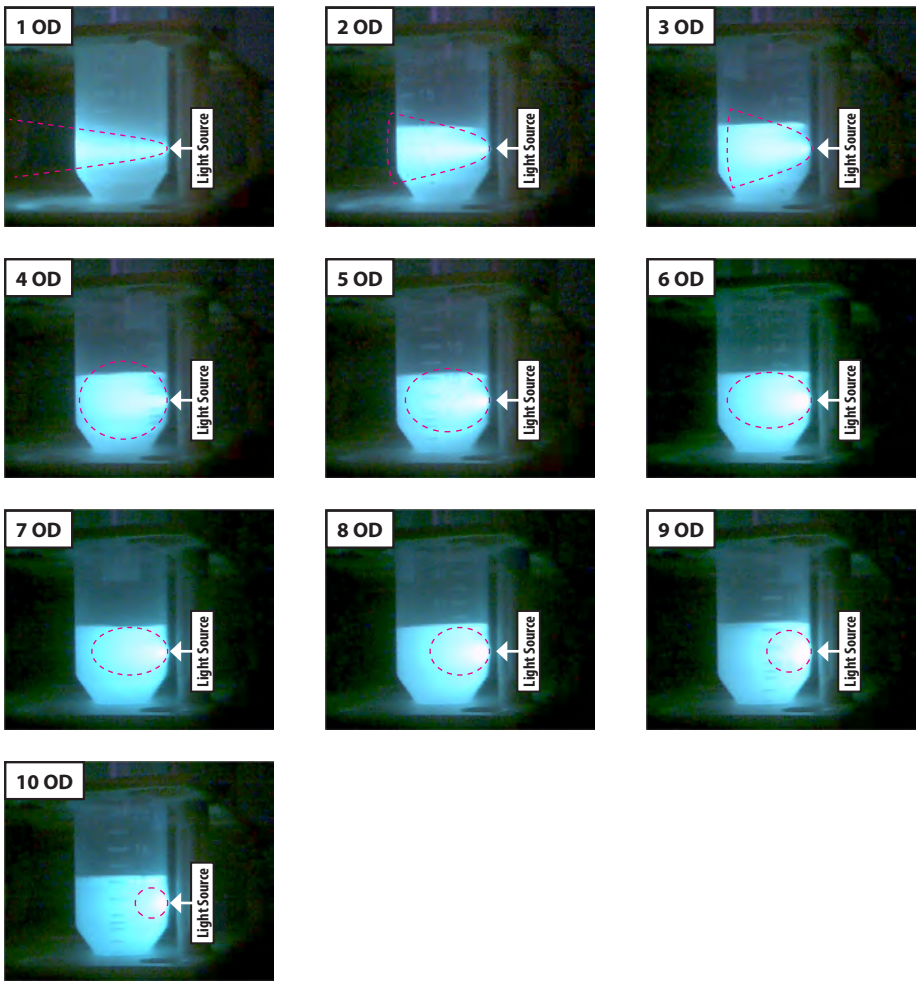
For a better visual representation of the results, the data of three factor interdependence experiments are presented in the form of the 3D graph (see fig. 4). Display of the experimental results in the 3D format has one more advantage that the obtained data provides a clear visual tool for the analysis of the complex interrelated processes of cell growth and allows to find the optimal and reproducible parameters obtained for the output of the cell material.

Growth rate versus time data, presented in the graph, was obtained during 20 hours long fermentation process and optical density was measured in a 10 minutes interval. The optical density was determined in the monolayer of growing cells and growth media formed as a result of a Vortex (as described in the legend to fig. 3). Volume of the culture medium is taken into account when calculating the length of the optical path of the rotating tube that allows to calculate the optical density in standard values familiar for biotechnologists (λ=600 nm, optical path: 10 mm).

Classical 2D data view of cell growth versus time obtained at the endpoint or during cell growth when cell density was measured at intervals of 1–4 hours do not provide such opportunity.

The Things to Think About: Behaviour of Light in the Environment of Different Densities

Fig 5. Experiment of Behaviour of Light in the Environment of Different Densities was carried out. Green (535 nm) laser was used in the Saccharomyces Cerevisiae of different optical densities (OD) in the range from 1 to 10 with 1 OD increment.



Conclusion

RTS-1 — Reverse Tube Spin cultivation based on the new method of external agitation of cultivation media, has been shown to be efficient for cultivation of aerobic microorganisms and cell growth logging.

Effective growth of E. coli on LB media has been demonstrated under extremely high speed rotation of the reactor (2,000 rpm).

To increase an OD measurement range we investigate near infrared (IR) spectra and showed that a 850 nm wavelength is sufficient to measure increased cell concentrations. Such wavelength shift (from traditional 600 nm to 850 nm) strongly expanded a range of correct OD measurements.

Moreover, we propose a new technology of a non-contact high biomass measurements during fermentation based on a formation of a thin layer of cultivation media, giving a correct data of bacteria concentration in a rotating reactor.

As a result, proposed RTS-1 technology excludes sampling and dilution procedure that is especially dangerous for harmful bacteria, pathogens or microorganisms living in extreme conditions, like Thermophilus. Results will be published in next issue of BioSan Analytica Journal.

Development and evaluation of DNA amplicon quantification

Case study: UV–Cabinet with UV Air Recirculator UVC/T-M-AR and Class II Biological Safety Cabinets

Authors

Biotechnomica: Marina Tarvida, Julija Isakova, Vasily Bankovsky

Biosan: Arturs Kigitovics, Vadim Gimelfarb

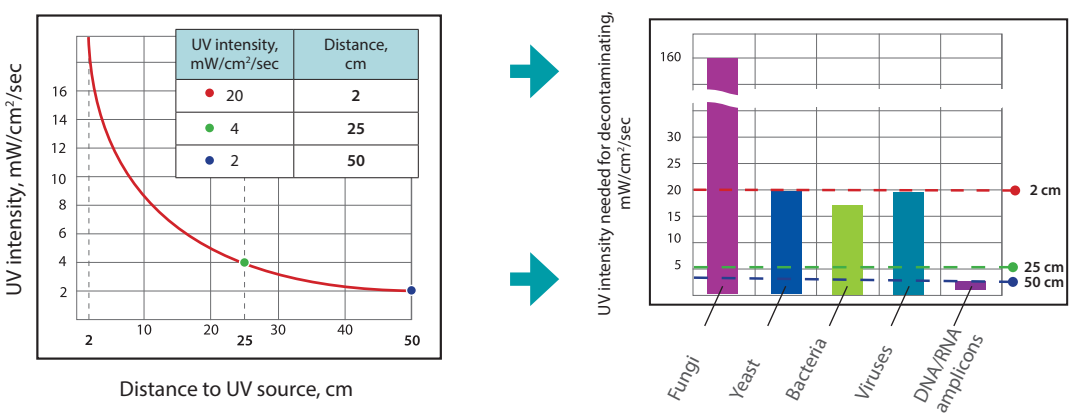
Introduction

Personal and product safety during clinical and laboratory studies have stimulated the development of sterile cabinets and special laboratory safety techniques, to protect the environment, operator, and product. Monitoring DNA/RNA amplicon concentration in laboratory air in sterile cabinets has become topical as PCR and isothermal amplification technologies have developed along with wide spread mass analyses.

Development of methods for repeatable DNA/RNA amplicon detection in air samples is now a reality. Recent research "Behaviour of aerosol particles in fibrous structures" (Igor Agranovsky's PhD thesis, 2008, Novosibirsk, Russia) describes the development of samplers and monitoring of DNA/RNA amplicon concentration in the air from sterile cabinets, microbial quantitative analyses.

UVC/T-M-AR, UV–Cabinet for PCR operations

Fig. 1,
Germicidal, shortwave (254 nm) ultraviolet energy is used for complete destruction of various biological agents



Aim of the study

The aim of this study is to evaluate the of efficiency of UV cabinets produced by BioSan (Latvia) in comparison to Class II BioSafety cabinets.

UV air treatment

More than a century has passed since the germicidal effect of UV light was recognized by Niels Ryberg Finsen — a Nobel Prize winner in physiology or medicine in 1903 [5], and many researches have been performed on UV induced destruction of DNA and microorganisms.

Low pressure germicidal UV lamps characteristically emit monochromatic low intensity radiation principally at 253.7 nm, within the germicidal wavelength range as defined by the DNA absorbance spectrum. The germicidal UV dose LP-UV lamps is calculated as the product of the volume averaged incident irradiance (E, mW/cm^2) and the time of exposure (t, seconds) resulting in units of mJ/cm^2 for UV dose [1] *(Fig. 1)*.

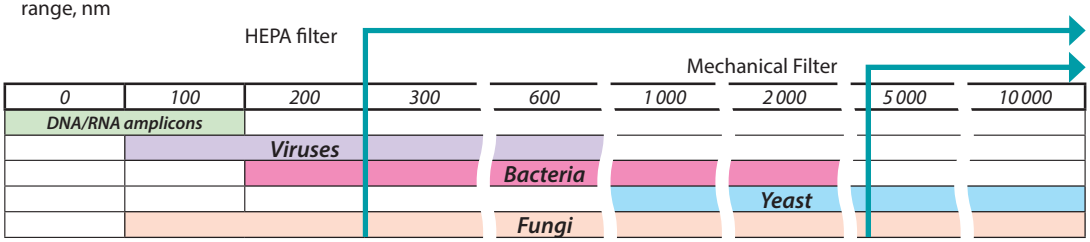
Air flow organization through HEPA filter

HEPA is an acronym for "high efficiency particulate absorbing" or "high efficiency particulate arrestance" or, as officially defined by the Department of Energy (DOE) "high efficiency particulate air".

The first HEPA filters were developed in the 1940's by the USA Atomic Energy Commission to fulfil a an efficient, effective way to filter radioactive particulate contaminants. HEPA filter technology was declassified after World War 2 and then allowed for commercial and residential use [6].

This type of air filter can theoretically remove at least 99.97% of dust, pollen, mold, bacteria and any airborne particles with a size of 0.3 µm at 85 litres per minute (l/min). In some cases, HEPA filters can even remove or reduce viral contamination. The diameter specification of 0.3 responds to the most penetrating particle size (MPPS). Particles that are smaller or larger are trapped with even higher efficiency [7] *(Fig. 2)*.

Fig. 2, Biological agent sizes and filters effectivity range, nm



Biological agent sizes, nm

Colony forming units (CFU) test

Media

LBA media was prepared using Standard Methods Agar (Tryptone Glucose Yeast Extract; Becton, Dickinson and Company) and dissolved in 1 litre of purified water. 7.5 grams of Yeast Extract (Biolife S.r.l.) and 5 grams of Tryptone (Difco laboratories) were added to enrich the media. The media was autoclaved at 121°C for 15 minutes. Media control samples were taken to check for presence/absence of colony forming units in media itself and the results were negative (0 CFU per 3 plates).

Experimental setup:

Impaction aerobiocollector airIDEAL 3P (bioMérieuxSA, France) was used to take air samples to test for the presence of colony forming units (CFU). Each sample was exposed to 500 litres of air. Aerobiocollector was set in the middle of the sterile cabinets for test samples and negative control samples, and in specific places in the middle of the laboratory room for positive control. The negative control was taken in Microflow ABS Cabinet Class II. This was repeated three times, the number of colony forming units was counted manually on each plate. Reading tables provided in airIDEAL 3P (bioMérieuxSA, France) The most probable number (MPN) of microorganisms collected per plate was estimated with respect to the number of agglomerates of colonies counted on the plate. (MPN was calculated from the CFU count using FELLER's law). Subsequently results were converted to CFU per m^3.

Mechanical contamination test

Instrument:

Laser particle counter (produced by Met One, USA) was used to determine mechanical contamination in the sterile cabinets and laboratory air as positive control.

Method:

Average amount of particles per litre of air were measured in sterile cabinet/laboratory air. Measurements were performed 9 times and the average value presented in the results as number of particles per m3 of air.

Two channels were used to measure amount of particles of different size: 5 µm and 0.3 µm. Mechanical filter stops particles larger than 5 µm while HEPA filter larger then 0.3 µm.

DNA Amplicon test

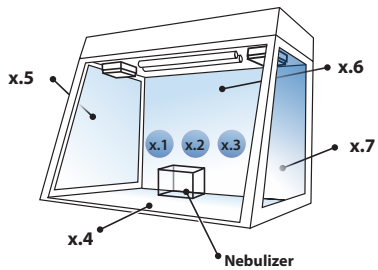
Instruments:

- Nebulizer, BioSan
- Shaker OS-20, BioSan
- Mini–Centrifuge/Vortex FV-2400, BioSan
- Centrifuge Pico 17, Thermo Electron Corp.
- Centrifuge-Vortex MSC-6000, BioSan
- Real–Time PCR cycler Rotor Gene 3000, Corbett Research

Reagents:

- Lambda DNA, Thermo Fisher Fermentas
- GeneJet Plasmid Miniprep Kit, Thermo Fisher Fermentas
- Real Time PCR reagents, Central Research Institute of Epidemiology

Fig. 3, Air and surface samples and surface sample taking path



Samples taken from:

x.1, x.2, x.3 : **Air** (Syringes)
x.4 : **Working surface** (Swab)
x.5, x.7 : **Side walls** (Swabs)
x.6 : **Back wall** (Swab)

Experiment setup:

- Sampling was performed as shown *on Fig. 3*
- Extraction and analyses were performed as shown *on Fig. 4*
- Quantitative PCR (Polymerase Chain Reaction):
  DNA amplicon quantification in sterile cabinets was performed by qPCR. Controls and standards were set in each experiment:
  - » 4 standards of Lambda DNA of different concentration prepared in 10 fold dilution: starting concentration 0.6 ng/µl or ≈1,000,000 copies/µl
  - » 2 NTC (no template control- sterile H_2O), experiment was considered successful only if control was negative.

After samples were taken and extracted as mentioned above, qPCR reaction master mix was prepared by adding the following components for each 25 µl of reaction mix to a tube at room temperature:

PCR mix:
2-FL : **7 µl**; dNTP's : **2.5 µl**; Forward Primer : **1 µl**;
Reverse Primer : **1 µl**; DNA probe : **1 µl**; Template DNA : **10 µl;**
Water, nuclease-free to : **25 µl**; Total volume : **25** µl

Sample taking path

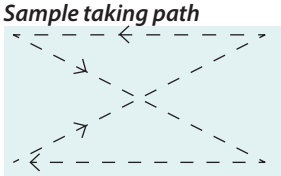


Table 1, Cycling protocol

Three-step cycling protocol steps	Temperature, °C	Time	Number of cycles
Initial denaturation	95	5 min	1
Denaturation	95	5 sec	42
Annealing	60	20 sec	42
Extension	72	15 sec	42

Detection Channel: FAM

❶ Air / ❷ Surface samples

Fig. 4, DNA extraction, samples analyses and result detection

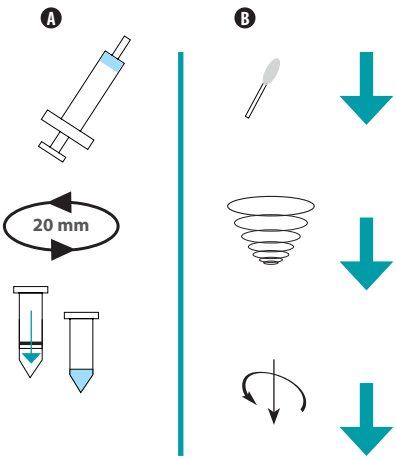
DNA extraction:

❶ From Air Samples :

- Incubation on Shaker OS-20 (BioSan) 180 rpm 15'
- Spin columned (GeneJet Plasmid Miniprep Kit, Thermo Fisher Fermentas)

❷ From Surface Samples:

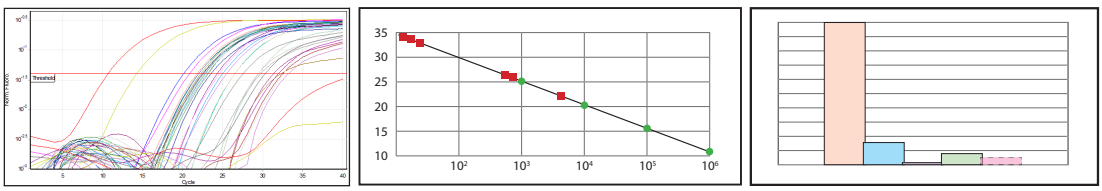
- Vortex 2-3"
- Centrifuge at 13,300 rpm for 2'



Isolated DNA:

❶ Real time PCR amplification *(Fig. 7)*
❷ Detection of Ct values and normalization of data *(Fig. 8)*
❸ Copy number estimation on cabinet volume and surface area

❶ ❷ ❸



Results:

Mechanical contamination

Results of mechanical air contamination in cabinets of two types: PCR cabinet (UVC/T-M-AR, BioSan) and laminar flow cabinets (BioSafety class II cabinet prototype by BioSan and BSC II cabinet ABS Cabinet Class II by Microflow) as the positive control laboratory air samples were taken (*Fig. 5*).

Microbial contamination

Microbial contamination in laboratory air and sterile cabinets. Quantitative results of microbial air contamination in cabinets of two types: PCR cabinet (UVC/T-M-AR, BioSan) and laminar flow cabinets (BioSafety class II cabinet prototype by BioSan and BSC II cabinet ABS Cabinet Class II by Microflow) as the positive control laboratory air samples were taken (*Fig. 6*).

Fig. 5, Mechanical contamination, 0.3 µm particles

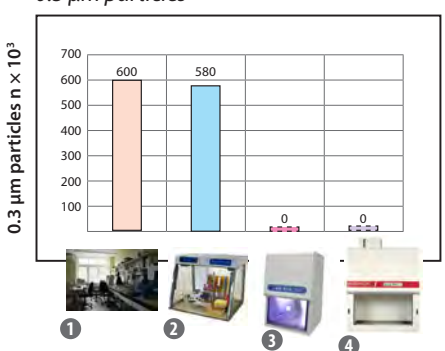
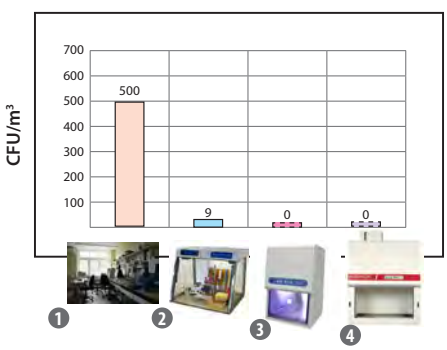


Fig. 6, Microbial contamination



Legends for figures 5 and 6:

❶ Positive control (laboratory air)
❷ UV Cabinet (UVC-T-M-AR, Biosan, Latvia)
❸ Laminar flow cabinet (HEPA BSC II Cabinet prototype, Biosan, Latvia)
❹ BSC II Cabinet (ABS Cabinet Class II, Microflow, UK)

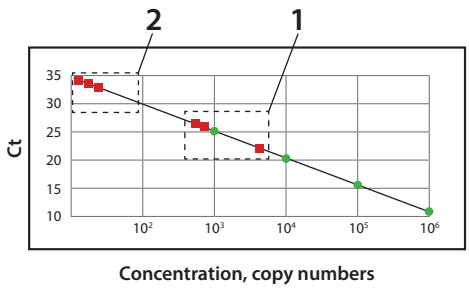
Amplicon contamination-inactivation efficiency:

Results analysis:

Real time PCR ensures product quantification using four standards of different Lambda phage DNA concentration and comparing Ct/Cq values of samples to those of concentration standards, based on standard curve *(Fig. 8)* (see Corbett Research Rotor Gene 3000 manual for more information) Following the amplification Lambda DNA copy number values were estimated for cabinet volume and surface area, results presented in *(Fig. 9)*.

Inactivation efficiency was calculated as ratio of DNA amplicons before and after treatment: direct and indirect UV treatment for 15 and 30 minutes, presented in percents in *table 2*.

Fig. 8, Standard curve, influence of direct and indirect UV irradiation on lambda phage DNA copy number



1 — *Samples after Lambda Phage spraying, no UV irradiation (positive control)*

2 — *Samples after 30 min UV inactivation*

● — *Concentration standards*

■ — *Samples*

Table 2. DNA amplicon inactivation efficiency in PCR cabinet UVC/T-M-AR, Biosan, Latvia

Fig. 7, Effect of UV irradiation on Ct/Cq values (raw results)

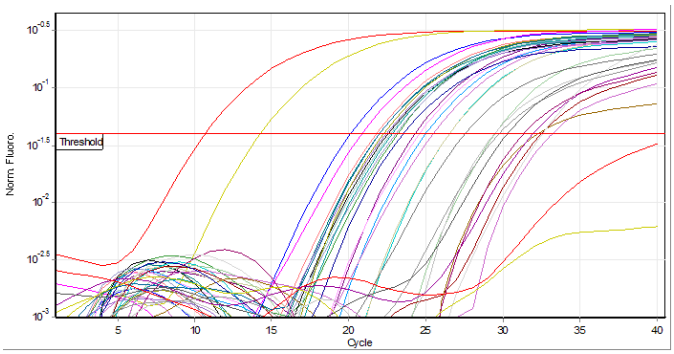
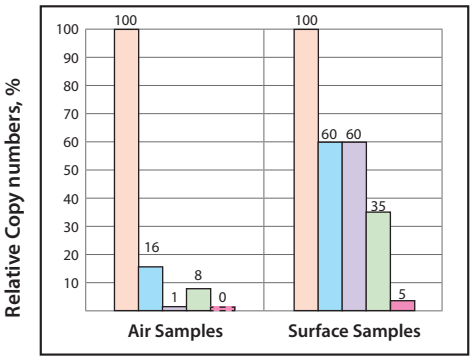


Fig. 9, Effect of direct and indirect UV irradiation on the amplicon concentration inside PCR cabinet UVC/T-M-AR, Biosan, Latvia



After Lambda phage DNA spraying

UV Air Recirculator for 15 min (Closed UV light irradiation, 25 W)

UV Air Recirculator for 30 min (Closed UV light irradiation, 25 W)

Open UV light (25 W) irradiation for 15 min

Open UV light (25 W) irradiation for 30 min

The horizontal axis show: air or surface samples, along with the relative copy number presented on vertical axis. Four series represent inactivation techniques and time of treatment, open UV light and UV air recirculator treatment kinetics are presented in the graph.

Sample	Inactivation method efficiency			
	15 min of UV Air Rec.	30 min of UV Air Rec.	15 min of Open UV + UV Air Rec.	30 min of Open UV + UV Air Rec.
Air Samples	84%	99%	92%	100%
Surface Samples	40%	40%	65%	95%

Calculation of UV dose for each treatment

Direct UV Irradiation

Cabinet's air treatment

BioSan's cabinet features a single open UV lamp 25 Watt, germicidal UV irradiation (253.7 nm) measurements have been performed and UV intensity were recorded at the level from 20 mW/sec/cm^2 to 2 mW/sec/cm^2 at distance to UV source from 2 cm to 50 cm respectively. [2] In PCR cabinet volume following UV intensity gradient is formed: from 2 mW/cm^2 to 20 mW/cm^2 *(Fig. 10)*.

UV dosage during treatment = UV intensity at specific distance (mW/cm^2/sec) × time of irradiation (sec)

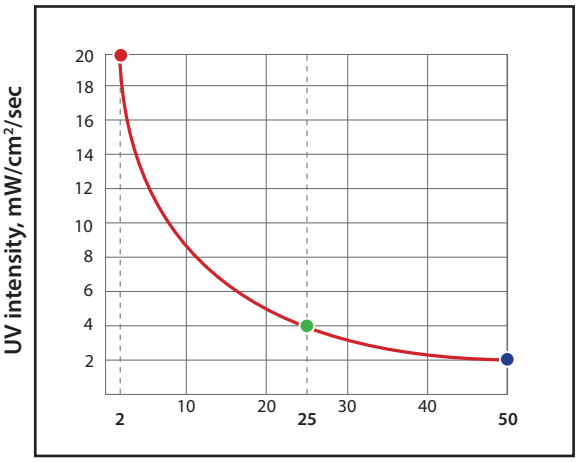
UV dosage during 15 min: gradient from 1,800-18,000 mW/cm^2

UV dosage during 30 min: gradient from 3,600-36,000 mW/cm^2

Cabinet's Surface treatment:

Distance to UV source ranges between surfaces and consequently the UV intensity *(table 3)*:

Fig. 10, UV intensity dependence on distance to UV tube (measured by radiometer VLX 254, Vilber Lourmat, France)



UV intensity, mW/cm^2/sec	Distance, cm
20	2
4	25
2	50

Table 3. Average dosage for different surfaces

Surface	Dosage after 15 min	Dosage after 30 min
Working surface (40-60 cm)	1,800-2,700 mW/cm^2	3,600-5,400 mW/cm^2
Side walls (10-60 cm)	1,800-5,400 mW/cm^2	3,600-9,000 mW/cm^2
Front window (10-60 cm)	1,800-5,400 mW/cm^2	3,600-9,000 mW/cm^2

UV air recirculation:

Cabinet's Air treatment

BioSan PCR cabinets feature UV air recirculator. Recirculator consists of a fan, dust filters and closed UV-lamp (25 W) installed in a special aluminium casing, which is located in the upper hood. Fan's air flow speed is 14 m^3/hour, which processes 1.3 cabinet volumes per minute. Distance from closed UV lamp to recirculator's walls is 2 cm at which UV intensity level is 20 mW/sec/cm^2 *(Fig. 10)*.

UV air recirculators are designed for constant air decontamination during operations.

Resulting in following UV dosage for cabinet's volume:

- During 15 min recirculation: 380 mW/cm^2
- During 30 min recirculation: 780 mW/cm^2

Cabinet's Surface treatment:

UV Air recirculator does not provide cabinet surface irradiation.

For deactivation of microorganisms and amplicons on the cabinet's surface additional open UV treatment is needed for protection against contamination

Conclusions

Air sampling methods developed by BioSan has been proven to be compatible with real time PCR detection of product. This method enables monitoring of laboratory air and sterile cabinet for presence of target DNA amplicons.

The research was designed to evaluate BioSan PCR cabinets' efficiency in comparison to Class II BioSafety cabinets. Based on the experiment results PCR cabinets prevent microbial contamination with inactivation efficiency up to 96%, but in comparison to Class II BioSafety cabinets do not provide protection against mechanical contamination.

UV air treatment in BioSan PCR cabinets for 30 min provides DNA amplicon deactivation efficiency:

- Combined UV treatment (Open UV and UV air recirculation) provides 100% efficiency
- UV air recirculation provides 99% efficiency
- Open UV irradiation provides 100% efficiency

Based on classification of BioSafety cabinets from European standard EN 12469 *[3]* and experiment results: BioSan PCR Cabinets and Class I, II, III BioSafety Cabinets were compared on product protection ability in *table 4*.

Further studies will be focused on:

- Development of high speed monitoring technology of RNA amplicon concentration in the laboratory air and in sterile cabinets.
- Investigation of Class II BioSafety cabinets efficiency against DNA amplicon contamination. Based on preliminary experiment results: DNA amplicon particles which are not stopped by HEPA filters *(Fig. 2)* can result in constant contamination of cabinets volume.

Table 4. Classification of sterile cabinets, based on protection against contamination

BioSafety cabinets	Protection against contamination forming units		
	Microorganisms	Viruses	DNA/RNA Amplicons
Class I	+	–	–
Class II (A1, A2, B1, B2)	+	–	–
Class III	+	–	–
BioSan PCR Cabinets	+ / –	+	+

Table 5. Relation of risk groups to biosafety levels, practices and equipment (source: Laboratory biosafety manual, Third edition)

Risk Group	Biosafety Level	Laboratory Type	Laboratory Practices	Safety Equipment
1	Basic — Biosafety Level 1	Basic teaching, research	GMT	None; open bench work
2	Basic — Biosafety Level 2	Primary health services; diagnostic services, research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
3	Containment — Biosafety Level 3	Special diagnostic services, research	As Level 2 plus special clothing, controlled access, directional airflow	BSC and/or other primary devices for all activities
4	Maximum Containment — Biosafety Level 4	Dangerous pathogen units	As Level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC or positive pressure suits in conjunction with Class II BSCs, double-ended autoclave (through the wall), filtered air

BSC, biological safety cabinet; GMT, good microbiological techniques

Table 6. Summary of biosafety level requirements (source: Laboratory biosafety manual, Third edition)

	Biosafety Level			
	1	2	3	4
Isolation [a] of laboratory	No	No	Yes	Yes
Room sealable for decontamination	No	No	Yes	Yes
Ventilation:				
— Inward airflow	No	Desirable	Yes	Yes
— Controlled ventilating system	No	Desirable	Yes	Yes
— HEPA-filtered air exhaust	No	No	Yes/No [b]	Yes
Double-door entry	No	No	Yes	Yes
Airlock	No	No	No	Yes
Airlock with shower	No	No	No	Yes
Anteroom	No	No	Yes	—
Anteroom with shower	No	No	Yes/No [c]	No
Effluent treatment	No	No	Yes/No [c]	Yes
Autoclave:				
— On site	No	Desirable	Yes	Yes
— In laboratory room	No	No	Desirable	Yes
— Double-ended	No	No	Desirable	Yes
Biological safety cabinets	No	Desirable	Yes	Yes
Personnel safety monitoring capability [d]	No	No	Desirable	Yes

a Environmental and functional isolation from general traffic.
b Dependent on location of exhaust (see Chapter 4 of Laboratory Biosafety Manual).
c Dependent on agent(s) used in the laboratory.
d For example, window, closed-circuit television, two-way communication.

Acknowledgement

We acknowledge BioSan for financial support and technical assistance, Anete Dudele for work done in the beginning of the research on microbial contamination in PCR cabinets.

We acknowledge Central Researcha Institute of Epidemiology (Moscow, Russia) and M. Markelov, G. Pokrovsky, and V. Dedkov in particular, for development and provision reagents for lambda DNA quantitative analysis using Real–Time PCR method.

We acknowledge Paul Pergande for donating his time and expertise by reviewing this article.

References

1. K Linden, A Mofidi. 2004. Disinfection Efficiency and Dose Measurement of Polychromatic UV Light (1-6)
2. BioSan UV-air flow Cleaner-Recirculators test report (http://www.biosan.lv/eng/uploads/images/uvrm%20uvrmi%20article%20eng.pdf)
3. European Committee for Standardization (2000) European standard EN 12469: Biotechnology-Performance criteria for microbiological safety cabinets.
4. Web source: http://nobelprize.org
5. Web source: http://www.aircleaners.com/hepahistory.phtml
6. Web source: http://www.filt-air.com/Resources/Articles/hepa/hepa_filters.aspx#Characteristics
7. Web source: http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf
8. Laboratory biosafety manual, Third edition

UVR-M and UVR-Mi, UV Air Recirculators Test Report

UVR-M and UVR-Mi, UV air recirculators Test Report

UV air recirculators UVR-M and UVR-Mi, produced by BioSan, are equipped with bactericidal UV lamps (Philips) and are used for air disinfection in research laboratories, hospitals and veterinary clinics.

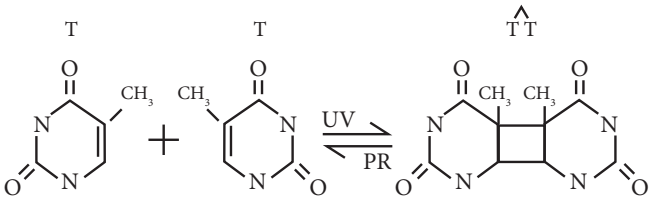
To show the efficiency of UV air recirculators UVR-M and UVR-Mi, we examined UV intensity in Philips 25W bactericidal UV lamps and an impact of UV radiation on various types of microorganisms.

General information

Photochemical reaction

UV radiation affects the viability of microorganisms by causing photochemical reactions in the structure of DNA and RNA. Adjacent pyrimidine molecules form dimers and block the reproduction of bacteria, as a result, causing their death.

The diagram below shows the process of formation of pyrimidine dimers using thymine as an example *(source: http://www.photobiology.info)*.



UVR-M

UVR-Mi

Destruction of microorganisms using UV radiation

The UV intensity needed for the elimination of microorganisms, such as yeasts, bacteria and viruses was previously investigated and reported by UVP Inc. A table below shows an amount of germicidal, shortwave (254 nm) UV energy needed for complete destruction of certain microorganisms.

Table 1, Destruction chart of bacteria and various organisms (source: http://www.uvp.com/pdf/ab-115.pdf)

Bacteria organisms	Energy: mW seconds per cm²	Other microorganisms	Energy: mW seconds per cm²
Bacillus anthracis	8.7	**YEAST**	
S. enteritidis	7.6	Saccharomyces ellipsoideus	13.2
B. Megatherium sp. (veg.)	2.5	Saccharomyces sp.	17.6
B. Megatherium sp. (spores)	5.2	Saccharomyces cerevisiae	13.2
B. parathyphosus	6.1	Brewer's yeast	6.6
B. subtilis	11.0	Baker's yeast	8.8
B. subtilis spores	22.0	Common yeast cake	13.2
List continues on the next page ...		***List continues on the next page ...***	

Bacteria organisms	Energy: mW seconds per cm²
... List continued from the previous page	
Clostridium tetani	22.0
Corynebacterium diphtheriae	6.5
Eberthella typosa	4.1
Escherichia coli	6.6
Micrococcus cadidus	12.3
Micrococcus sphaeroides	15.4
Mycobacterium tuberculosis	1.0
Neisseria catarrhalis	8.5
Phytomonas tumefaciens	8.5
Proteus vulgaris	6.6
Pseudomonas aeruginosa	10.5
Pseudomonas fluorescens	6.6
S. typhimusium	15.2
Salmonella	10.0
Sarcina lutea	26.4
Sarratia marcescens	6.1
Dysentery bacilli	4.2
Shigella paradysenteriae	3.2
Spirillum rubrum	6.1
Staphylococcus albus	5.7
Staphylococcus aureus	6.6
Streptococcus hemolyticus	5.5
Streptococcus lactis	8.8
Streptococcus viridans	3.8

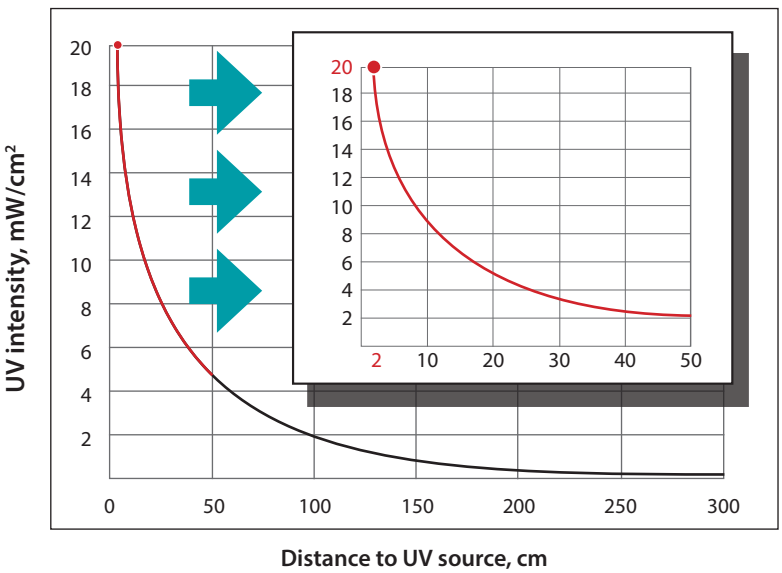
Other microorganisms	Energy: mW seconds per cm²
... List continued from the previous page	
MOLD SPORES	
Penicillium roqueforti	26.4
Penicillium expansum	22.0
Penicillium digitatum	88.0
Aspergillus glaucus	88.0
Aspergillus flavus	99.0
Aspergillus niger	330.0
Rhisopus nigricans	220.0
Mucor racemosus A	35.2
Mucor racemosus B	35.2
Oospora lactis	11.0
VIRUS	
Bacteriophage (E. coli)	6.6
Tobacco mosaic	44.0
Influenza	6.6
PROTOZOA	
Paramecium	200.0
Nematode eggs	92.0
Chlorella vulgaris (algae)	22.0

Results

UV Intensity measurements of Philips 25W bactericidal UV lamp

UV intensity depends on the distance from the UV source. The graph below shows that UV intensity drops dramatically as the distance increases.

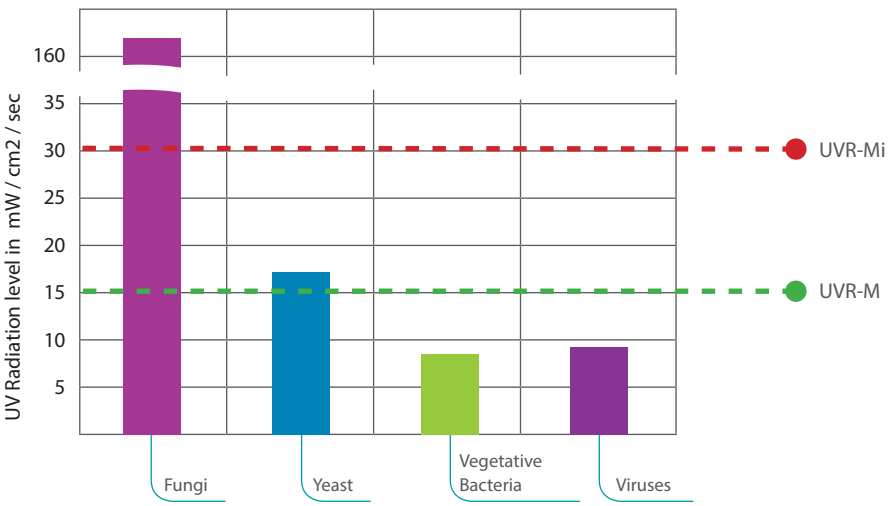
Dependence of UV intensity over distance to the UV source, one lamp 25 W



Distance, cm	UV intensity, mW/cm²
● 2	20.0
7	10.0
25	4.0
50	2.0
100	0.5
200	0.1
300	0.05

● — Distance from UV lamp to recirculator's walls

Sensitivity of microorganisms to UV radiation intensity in UV air recirculators UVR-M and UVR-Mi



Microorganism examples

Yeast

- Saccharomyces cerevisiae
- Brewer's yeast

Viruses

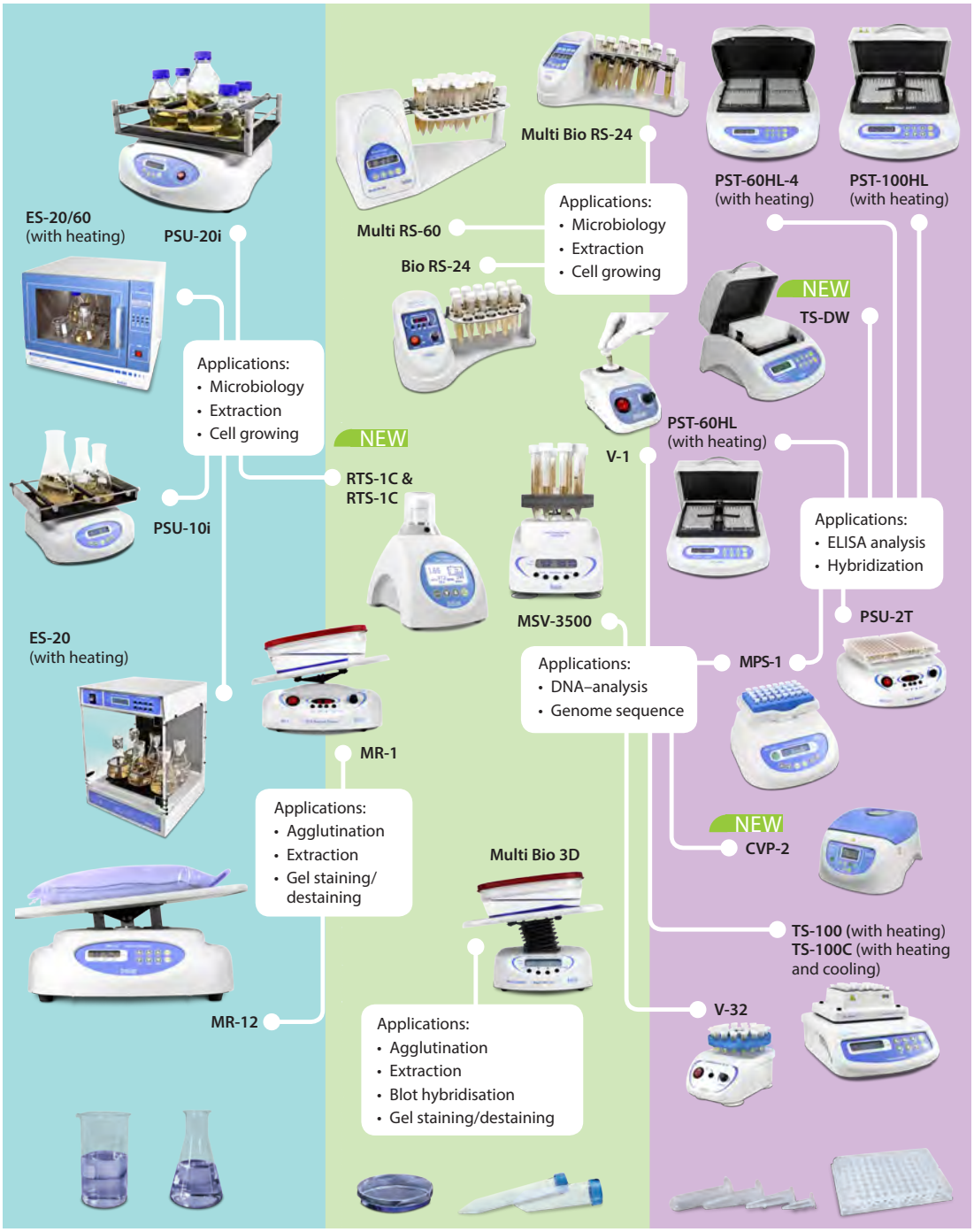
- Bacteriophage (E. coli)
- Influenza

Vegetative Bacteria

- Clostridium tetani
- Mycobacterium tuberculosis
- Salmonella
- Dysentery bacilli
- Staphylococcus aureus
- Streptococcus hemolyticus

BEFORE AFTER

How to Choose a Proper Shaker, Rocker, Vortex



Level of liquid

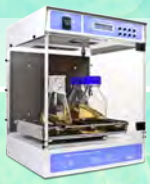
10^3 ... 10^2 ml	10^1 ml	10^0 ... 10^{-3} ml
Erlenmeyer flasks and Cultivation flasks	*Petri dishes, vacutainers and tubes up to 50 ml*	*PCR plates, microtest plates and Eppendorf type tubes*

STAGES:

Centrifugation for DNA Extraction	Microspin 12, page 47	
Centrifugation for DNA Extraction in plates	LMC-3000, page 48	
Sample preparation: Smooth resuspending and centrifugation	MSC-6000, page 44	or similar, see Multi–Spins, page 44 and Combi–Spins, page 43
Sample preparation in UV–Cabinet for PCR	UVC/T-M-AR, page 86	or similar, see UV–Cabinet for PCR, page 87
Sample Thermostating and Incubation	TDB-120, page 55	TS-100C, page 31
Amplification	Thermocyclic amplificator (on request)	
or		
Fluorescence End–Point Analysis	ALA-1/4 (on request)	
or		
Electrophoresis	Electrophoresis Systems (on request)	
Real-time Amplification	Real-time Amplificator	

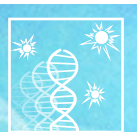
STAGES:

Sample Preparation in temperature controlled laminar flow cabinet	TLC-S, page 92
Cultivation	ES-20, page 36 / ES-20/60, page 37
or	
Results Reading	DEN-1B or DEN-1, page 96
Cultivation and Real-time Results Logging	RTS-1, RTS-1C, page 38



STAGES:

Sample preparation in UV–Cabinet for PCR	UVC-T-M-AR, page 86 or similar, see PCR cabinets, page 87
Sample and Reagents Resuspending	MPS-1, page 16 / or similar, see Vortexes, page 23
High Speed Centrifugation	Microspin 12, page 43
Vacuum Aspiration	FTA-1, page 104
Incubation	TDB-120, page 55



STAGES:

Sample Preparation in temperature controlled laminar flow cabinet	TLC-S, page 92

Incubation	PST-60 HL, page 28	PST-60 HL-4, page 28

Washing (Automated)	IW-8, page 100

Washing (Manual)	FTA-1 with MA-8, page 104

Analysis	HiPo MPP-96, Microplate Photometer, page 98